sound ideas

A QUARTERLY GUIDE TO THE WORLD OF AUDIO

A report from the Winter CES, cassettes after Philips, Bernie Mitchell at Advent, the man who invented FM, plus a complete FM-concert guide

MAGAZINE SUPPLEMENT, MARCH 11, 1980

THE BOSTON Phoenix

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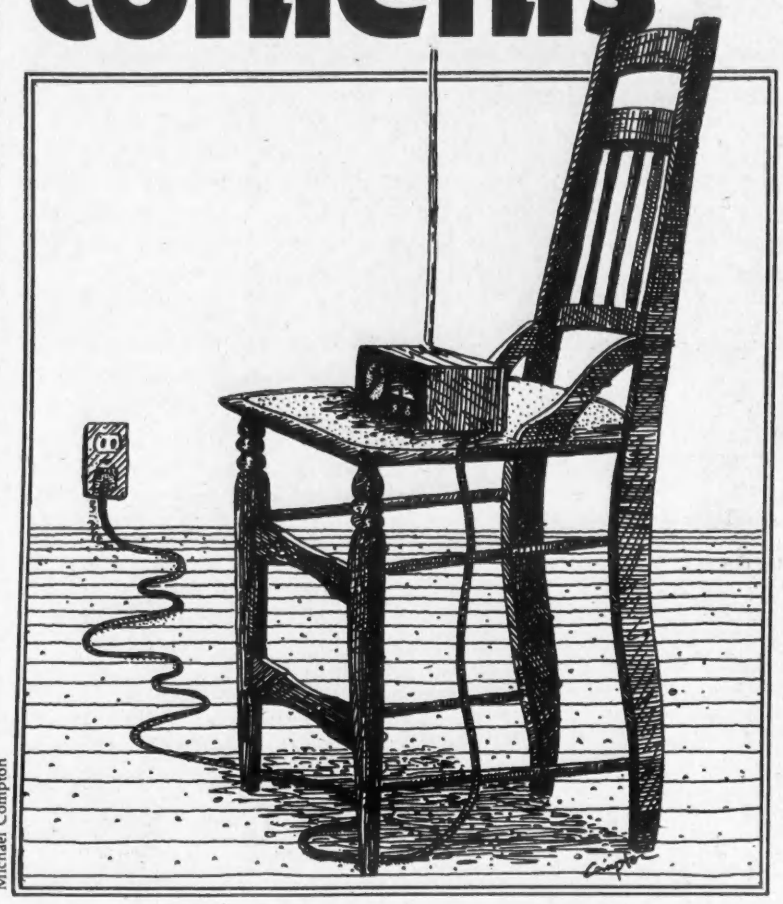

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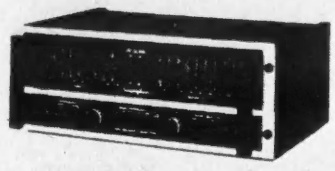

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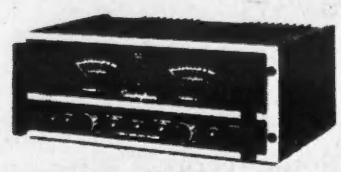

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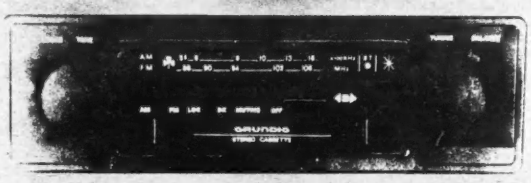

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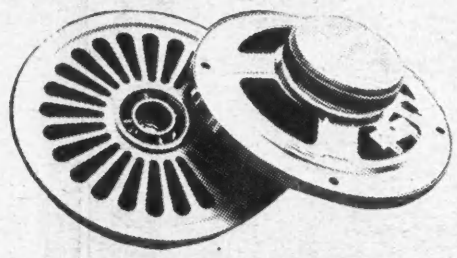

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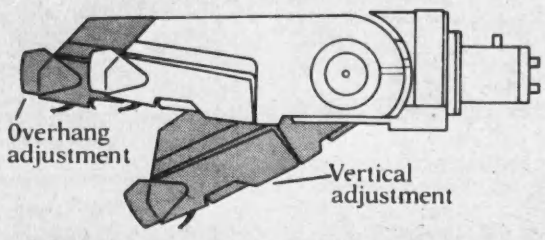

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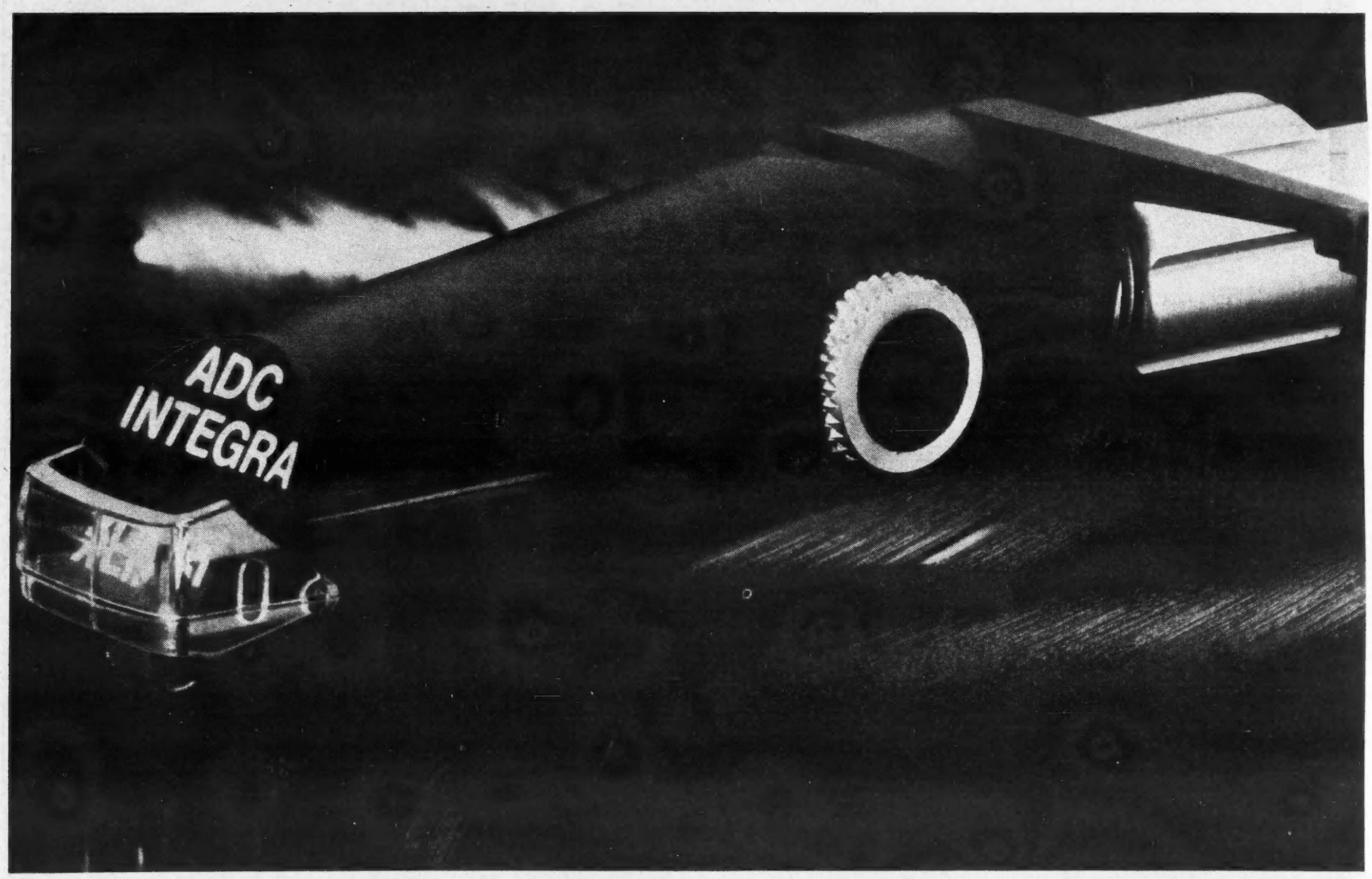

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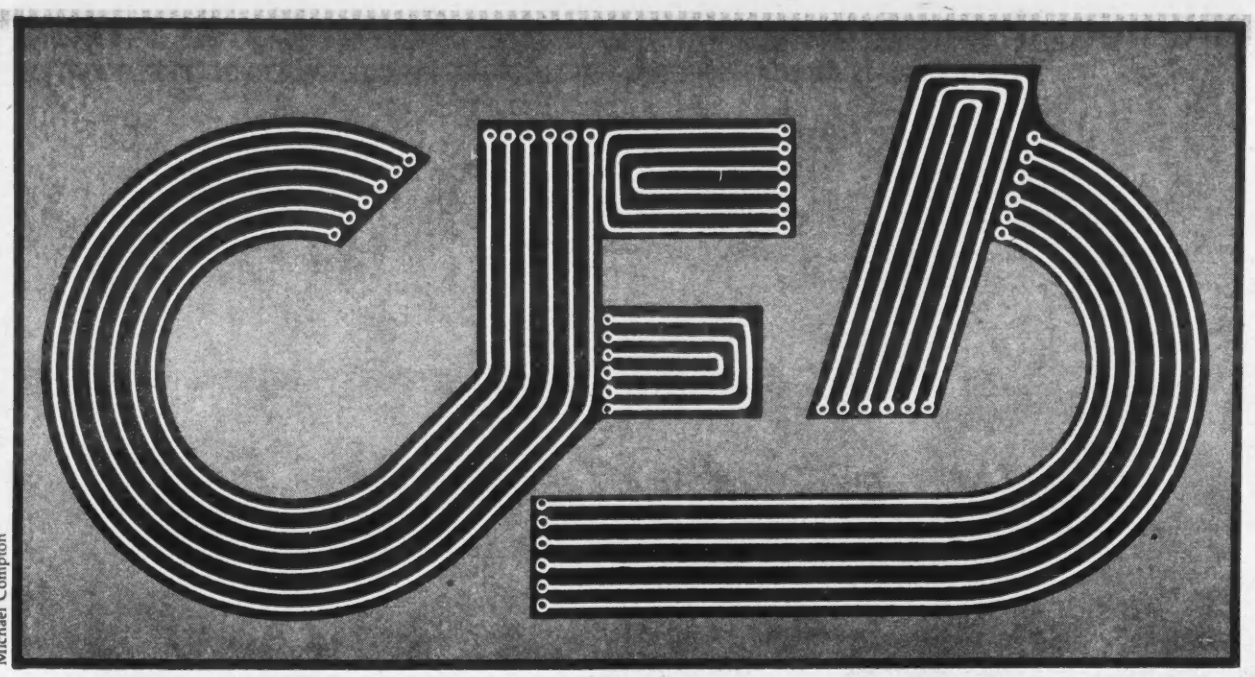

Michael Compton

All that glitters in Vegas

A report from the Winter Consumer Electronics Show

by Peter W. Mitchell

Last January, 55,000 members of the elctronics industry (manufacturers, dealers, members of the press) convened in Glitter Gulch among the slot machines, "21" tables, and showgirls for a bid display of new products at the Winter Consumer Electronics Show. While Old Blue Eyes celebrated his 40th career anniversary at Caesar's Palace, the rest of the hotels in Las Vegas were filled with people talking about new phono cartridges, video recorders, loudspeakers, electronic games, and digitally mastered recordings. In this report we will look at some of the more interesting new electronic products.

We might as well begin with a few that aren't really products. In recent years the major Japanese manufacturers have adopted the habit of showing off not only the products they have for sale but also occasional engineering prototypes of products that won't be available for another year or two or three, if ever. Since such products typically employ the most advanced and exotic technology, they draw a lot of viewers and create a lot of comment — which is exactly why they are an effective PR tool for the manufacturers.

In this vein, the hottest "products" on display at this year's Winter CES were electronic goodies that listen and/or talk to the user. That's right, electronic components can now be equipped with ears and a voice. Quasar's entry was the world's first talking microwave oven, basically a conventional microwave oven equipped with an electronic voice synthesizer that speaks to the user during various cooking operations. Typical voice-synthesized announcements include the temperature of the food, the cooking time that remains, and (when the meal is ready) a call to enjoy a hearty repast. Sanyo's collection of novelties included a voice-input calculator containing a microphone instead of the usual set of numerical keys. As you pronounce numbers and arithmetical commands, it displays them on a TV screen and then completes the calculation and displays the result.

For lonely arithmetic buffs (or, more seriously, perhaps for the handicapped), Sanyo also showed a "conversational" calculator that not only accepts spoken numbers and computing commands but also talks back, confirming inputs and announcing the results in a female voice. Curiously, the spec sheet indicates that the unit has a voice-recognition capacity of 18 words and a voice-synthesis capacity of 32 words, although it is not immediately obvious why it might take a larger vocabulary to answer arithmetical questions than to ask them. Sanyo's third novelty is a line of digital watches and calculators whose power is provided by a new high-efficiency, low-cost solar cell.

Toshiba's entry in the vocal brigade was a voice-actuated TV set that responds to commands such as "power on," "volume up," and "channel 5"; and a still more elaborate "acoustic remote command" stereo component system that recognizes and obeys 21 spoken commands such as "turntable play," "tape pause," "tuner scan up," "tape record," "volume down," etc. It includes a voice-registration mode that uses a sampling and pattern-matching program to memorize, recognize, and respond solely to its owner's voice and no other. It gives new meaning to the old phrase "His Master's Voice."

Another category of novelty is the multiscreen TV, basically a conventional TV whose picture is electronically subdivided to display several pictures in various portions of the screen. The current version of this idea is the "picture in a picture": a color TV with a separate small black-and-white picture nestled in one corner of the screen showing a second channel or the signal from a closed-circuit TV showing activity in the children's playroom or by the burglars at the back door. The new sets shown in prototype form in Vegas give you more than two pictures, all in color (three pictures in the Sampo, four in the Toshiba, and nine in the Sharp TV). Can you think of any reason for watching all nine channels at once?

Sony's vision of the future was a display called ACCESS, for Automatic Computer-Controlled Entertainment Selection System; it combined a projection TV, microcomputer, and a complete audio system, with the computer serving as an information library, TV- and FM-program schedule, disc and tape catalogue, and timer/controller for programed viewing, listening, or recording. In use, such a system would be connected to an interactive cable system in order to provide access to more programing and outside data-information banks.

As noted, these products are speculative and won't be found in stores any time soon. So now we will turn to products identified as being for sale sometime during 1980. (Some may even be in the stores by the time you read this.) I'm not going to try to provide a comprehensive list of all the new products, but rather give a survey of the highlights and trends.

The major trend in hi-fi is convenience, specifically remote control and automated operation. Lots of new cassette decks offer remote control by means of either a plug-in cable or an infrared transmitter; this feature has appeared previously in expensive machines and is now making its way into decks for $500 or less. The idea is spreading so rapidly that every manufacturer will soon consider it obligatory to provide remote control in at least one model, and several are experimenting with remote control for the full stereo system. Kenwood, for example, showed an infrared controller that operates a turntable, amplifier, and digital tuner, providing real armchair convenience for the person who is willing to limit himself to the specific Kenwood models designed to work with the controller.

Automated timing is for many an even more valuable convenience, as illustrated by the popularity of video-cassette recorders containing a microprocessor that can be programed to switch the recorder on and record any desired channel at any time over a seven-day period. Philips and Sanyo are among the manufacturers who have introduced programmable timers for hi-fi systems, which can turn the tuner and tape deck on and off at scheduled times to record broadcasts while you are out, and switch a radio or light on and off at assorted times to make the house look occupied while you are away on vacation, etc. Various products of this type will retail for $100-$200. If you need less-elaborate timer functions, consider the Copal MG-130 on-off timer, which sells for under $50; it uses a mechanical rather than electronic timing mechanism but works quite well to switch the stereo system (or just a tuner and tape deck) on and off once at scheduled times within a single 24-hour period (or at the same time every day). A cheaper Copal timer that appeared a couple of years ago could be used to switch the system on at a selected time, but it automatically turned off after about an hour and a half; the new one provides independently settable on and off times.

Toshiba is one of several manufacturers of programmable TV sets that will automatically turn on, tune to desired programs at scheduled times on various channels, and (finally) switch off. Some of the new TV sets also have extra channels built in for use with cable systems, relieving the need to use an external tuning adapter. BSR's new Accuglide turntable employs technology derived from the ADC Accutrack units; it has an infrared remote control and can be programed with up to 27 commands to play assorted songs in a stack of records in any desired order. It is a changer, of course, but instead of just dropping records it slides them down the spindle for play and then, when it needs to get to a previously played disc down in the stack, it slides records back up the spindle. Finally, Eumig's new $1000 toy is a cassette deck that, instead of having an internal microprocessor for automated operation, is designed to be connected to your Apple or Pet or Radio Shack personal computer for programed use.

Electronics

The principal trend in amplifier design, as in automobiles, is "down-sizing." By using more-efficient heat sinks, rugged new transistors, and circuits having improved "dynamic headroom" above their rated continuous-power level, amplifiers can be made more compact while being able to play louder. This applies to ordinary amplifiers and receivers as well as to the specially small mini- or microcomponents. Shrinkage is also resulting from the end of the horsepower race. A couple of years ago, the major manufacturers of stereo receivers were competing to see who could make the biggest and most powerful one, but it has become clear that people who want more than 100 watts per channel also generally prefer separate components. So new receivers generally are being designed only in the under-100 watt range. Sony's much-advertised new line of digital receivers, for instance (with the headline "Sony Reinvents the Receiver"), range only from 28 to 55 watts of rated output. Sony's use of an ultrasonic-switching power supply keeps these units compact and lightweight, while Harman-Kardon and others are using toroidal power transformers to help maintain low-profile appearances. A few manufacturers have recognized the importance of designing amplifiers to interact correctly with the variable and often low impedances of loudspeakers, but most haven't yet; even the largest of those Sony receivers, for example, is limited to only 3 amperes of output current, so it will deliver its advertised power only to speakers of true 8-ohm impedance and not to speakers whose impedance falls to 4 ohms or lower. Kenwood's design focus continues to be on extremely fast response for good operation at ultrasonic frequencies, while Lux and Harman-Kardon are emphasizing low feedback (for minimum "transient intermodulation distortion") in their designs; the H-K 770 amplifier employs only 17 dB of negative feedback, while the Lux Duo-Beta circuit has minimal feedback at high frequencies but lots at low.

The shrinkage of product sizes has also been aided by ICs, which permit a manufacturer to add digital frequency-synthesis tuning (not merely digital display) to tuners and receivers at all price levels. But many manufacturers are continuing to offer products with conventional tuning dials in the belief that a lot of customers simply prefer them. Thus H-K's new 700 series of low-profile components includes one pre-amp, one power amp, one cassette deck, but two tuners (a digital and an analog model), to cover both bases.

Pioneer, the largest maker of hi-fi components, has a standardized chronology for introducing new models on a two-year cycle. This being the winter of an even-numbered year, they introduced three new receivers, with model numbers 3600, 3700, and 3800, which will probably be the successors to the present models 680, 780, and 880. In recent years the battle for second place in sales behind Pioneer has been among Marantz, Sansui, Technics, and Kenwood, but another contender for a large piece of the market has now entered the fray. Sanyo has a large collection of factories with remarkably efficient production lines turning out cassette decks, radios, and stereo receivers at relatively low cost, and for some years has been marketing its products under other brand names, such as Sears, KLH, and Fisher. They have now started a big push to make themselves a major factor in the hi-fi market, putting their manufacturing efficiency to good use by offering well-made products at budget prices, and on the other hand they have expanded their command of advanced technology to make a high performance "Plus" series of more-costly and refined products. One of the latter is the Plus P55 MOSFET power amplifier; like that of other recent MOSFET amplifiers, its excellence is due in part to the self-limiting characteristic of the MOSFET output transistors, eliminating the need for the usual current-limiting "protection" output of the amplifier when driving real loudspeaker impedances. But while MOSFET

Continued on page 44

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Just how much is too much?

The new multi-featured decks

by Paul D. Lehrman

In this and many other Western countries, patents and licensing agreements expire after 17 years. In the world of audio technology, where advancements occur at an exponentially increasing rate of speed, that length of time is an eternity, and patented developments are often obsolete long before they move into the public domain. Two exceptions are now garnering a lot of attention, and threaten to turn the audio industry on its well-developed ear. The first will affect only the special field of professional recording; it concerns the recent expiration of patents held by EMT (a German firm) on the ubiquitous plate-reverberation unit, and the subsequent appearance of a plethora of domestically made units at very attractive prices. The second development, however, concerns anyone involved with music, including musicians, equipment-makers, and listeners: it has to do with the expiration of the cassette-related patents heretofore held tightly by the Dutch giant of Philips.

When that company first developed the cassette idea, it realized it had a product it could never handle properly by itself, and had the foresight to offer licensing arrangements to just about any company in the world that was interested in manufacturing equipment or tapes for the new medium. While permission to produce goods under the licensing agreements was cheap and easy to come by, Philips included one important proviso: that any cassette recorded on any tape machine be playable on any other machine.

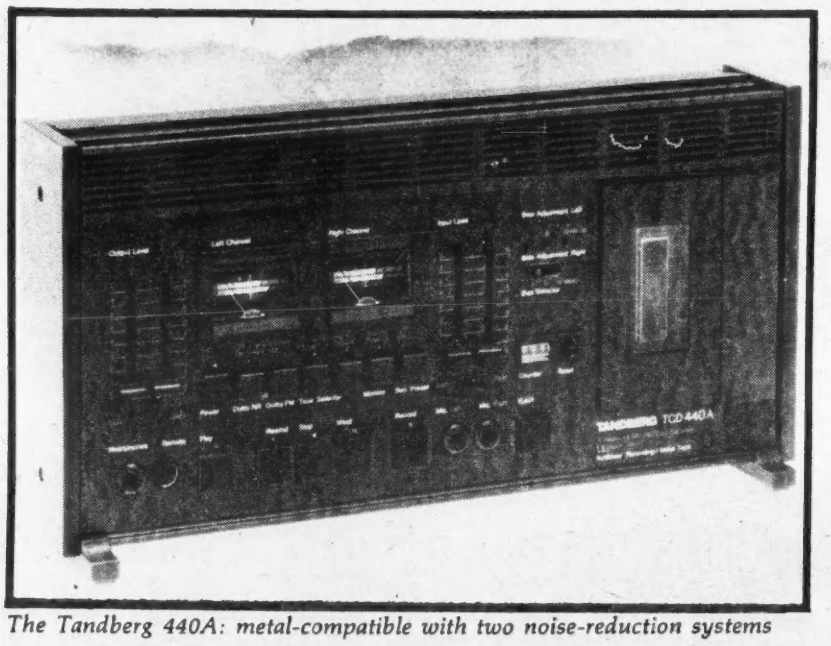
While many manufacturers and designers complained that this restriction stifled development of the medium into a true source of high fidelity, Philips's obstinacy proved ultimately to be mostly beneficial — to the buying public as well as to the company itself. By ensuring that all cassettes and machines, past and future, were compatible, Philips prevented the kind of debacle that destroyed quadraphonic stereo and threatens now to cripple the video disc even before it becomes widely available. The concept of several incompatible designs' competing to accomplish a similar goal created tremendous problems for stereo broadcasting, discs, and open-reel tape in the years immediately preceding the cassette's introduction, and Philips was determined not to lose its corporate shirt over the same issue.

Philips has been challenged almost constantly over the years by companies wanting to try something a little different — Sony, for instance, built a stereo cassette deck some years ago on which a user could record one track at a time. Philips killed the idea by noting that such a machine would be capable of recording four distinct mono programs, and any cassette so recorded would not play back properly on a deck that wasn't designed to control playback of individual stereo channels — in other words, any mono machine. The Sony units never left the Tokyo docks. During the quad fad, several companies announced designs for single-direction four-channel cassette decks; Philips killed these, too, for similar reasons.

Other companies proposed changing the tape speed in order to provide better fidelity (at a faster speed) or longer playing time. The latter idea was adopted, but only for special educational and industrial purposes, such as books for the blind. Variable speed, a must for musicians who like to play along with tape, was proposed by Yamaha, and initially met with the usual resistance from Philips. The manufacturer was finally allowed to build the feature into one of its decks, but was forced to design the machine so that the record interlock defeated the feature — it could be used only on playback.

The Optonica RT-6905: it can even make toast.

Dual's 839RC: record and playback in two directions



The Tandberg 440A: metal-compatible with two noise-reduction systems

A few Japanese companies tried to circumvent the whole problem in the early '70s by introducing the Elcaset, a system similar in principle though quite superior in specification, but the idea fell flat in the retail market.

The only successful dents in Philips's compatibility standards occurred when Dolby B noise-reduction and chromium-dioxide tapes were introduced, the latter requiring non-standard bias and equalization curves to achieve maximum fidelity. Following intense pressure from DuPont, inventors of the chrome-tape formula, Philips caved in and allowed licensees to build the new bias and EQ parameters into their decks. Similarly, it took a lot of lobbying from Advent, Harman-Kardon, and several other companies before Philips would allow Dolby to be built into cassette machines; permission was granted only after outboard Dolby units appeared on the market, threatening to sidestep the issue, and after Philips itself unsuccessfully tried to market a playback-only noise-reduction system called DNL.

All of these battles, though, have apparently been fought in anticipation of the time when the Philips patents expire and the cassette world will be free to plunge itself into a new Dark Age. And that time is now. Between 1980 and 1985, all of the Philips patents in this country will run out, and with them will go many of the long-standing licensing agreements. Manufacturers around the world are breathless in anticipation of the day they can run wild. Inasmuch as court battles can take years to resolve, many companies aren't even waiting for the body to cool, and already are introducing cassette decks that grossly violate Philips's guidelines. Still other manufacturers are sticking to the guidelines for the time being, but are taking advantage of the turbulent climate to push onto the market units loaded with innovative and often downright bizarre features.

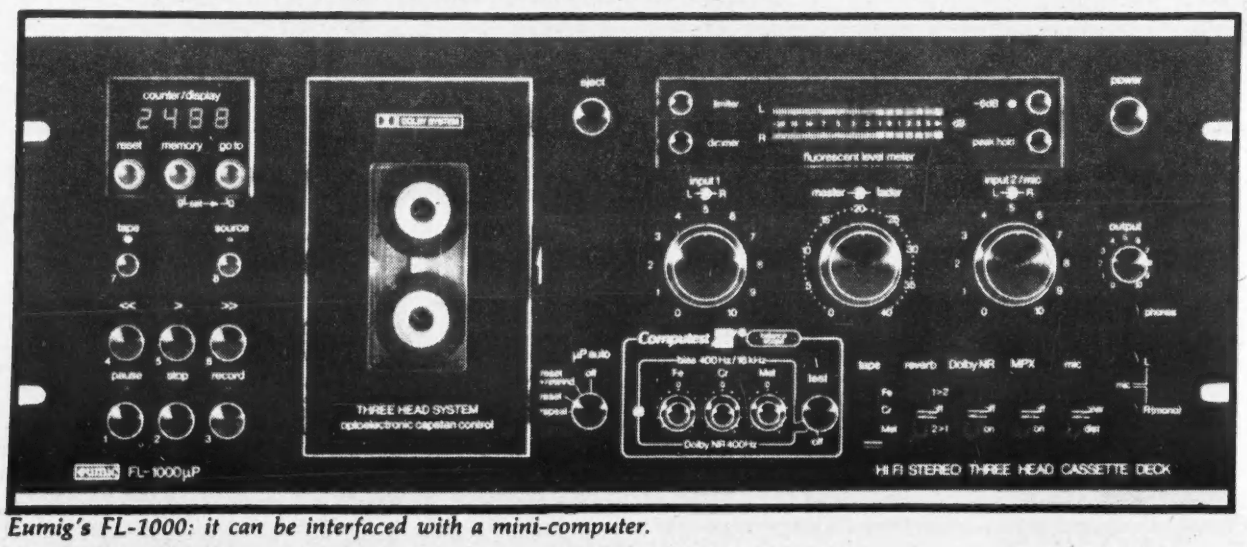
JVC was the first company to include in its equipment a noise-reduction system not compatible with Dolby. Introduced not long after Dolby came on the scene, JVC's Automatic Noise Reduction System (ANRS) was a two-mode gadget. "Regular" ANRS closely matched Dolby's compression and equalization curves and was considered compatible, but "Super" ANRS was decidedly not.

Now Nakamichi is selling an *outboard* noise-reduction system called High-Com II, which is being licensed to the Japanese company by Telefunken, a German company whose professional noise-reduction system has met with modest success in European recording studios. The High-Com II divides the audio signal into high and low bands and compresses them separately, not unlike professional Dolby A systems, which use four bands. This, added to the fact that the High-Com system uses a faster attack time in its compressors than Dolby B, makes the two systems quite incompatible. The unit, which sells for $750 (remember — this does not include the tape deck), also features a multiplex filter that cuts off everything above 19,000 Hz, and an infrasonic filter that acts below 30 Hz. These are included to prevent mistracking of the compressor/expander caused by leaking FM pilot tones, low-frequency rumble, or warped records.

The deck that Nakamichi more or less expects you to plug into the High-Com II is its model 680, which has a few tricks of its own. Besides its own multiplex filter, and the adjustable bias and equalization, optional remote control and timer operation, fluorescent level displays and metal-tape capability, all of which have become *de rigueur* in top-of-the-line decks, the 680 has a feature called Random Access Music Memory, which notes blank spaces in the music program and counts them, up to 18, displaying the number with an LED readout. The transport can be programed to skip over as many selections as the user wants, making the tape deck nearly as flexible as a record player. The deck has adjustable tape speed, up to six percent faster or slower, operable in playback and record modes, and the thing can even run at 15/16 inches per second — half normal speed. Nakamichi is quite serious about the half-speed mode, and claims response up to 15,000 Hz (at -3 dB, using metal tape), signal-to-noise ration of 60 dB (at three percent distortion, again with metal tape and Dolby), and weighted peak wow and flutter of 0.14 percent at 15/16 ips — specs that cheaper decks would be proud to claim at normal speed.

Nakamichi had to invent its own equalization curves for the half-speed mode, and makes no pretense about its deck's compatibility with other machines in that regard. This company, you may recall, came out with what many consider the first truly high-fidelity cassette deck, the Model 1000, in 1976. It offered, for the first time, built-in pilot tones for head-azimuth adjustments, continuously variable bias, and switchable

Continued on page 32



Eumig's FL-1000: it can be interfaced with a mini-computer.

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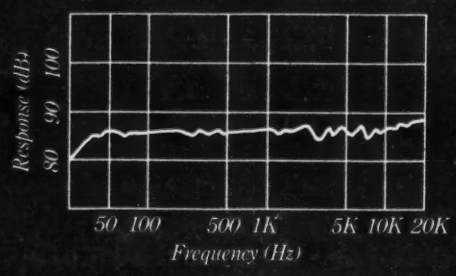

On-axis frequency response, L212 system.

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Tracks through the years

A history of tape-recording formats

by Paul D. Lehrman

The growth of tape recording in this country has been an odd progression. Breakthroughs, ingenious conceptions, setbacks, stupid ideas, wrong turns, marketing bombs, lousy products — all of them landmarks on the road to whatever recorder sits on your hi-fi shelf. The first cousin of phonograph records and radio broadcasting and the bastard nephew of recording-studio technology, home tape recording has, in the last 25 years, endured probably a dozen serious format changes; now that it seems to have settled down a bit, digital technology threatens to make everything obsolete. Before that happens, however, it might be a good idea to learn a little bit about what's happened to date.

Recording sound waves on a moving magnetic medium was an idea first put into practice by Nazi manufacturers in the late '30s. Their first machines used iron or steel wire, which was magnetized using a pair of magnets flanking its path, more or less in step with sound patterns picked up by a microphone and amplified by rather sophisticated tube amplifiers. After the war, American and European firms, attempting to improve on the limited dynamic and frequency ranges inherent in the wire recording process, developed magnetic tapes that not only provided better sound but also were much easier to handle and to store. Soon, technology was developed that could record sound with a single head on one side of the tape, and the modern tape recorder was born.

The first home recorders, which appeared in the stores around 1951, were bulky affairs that used 10½-inch reels that spun so as to pass the tape over the heads only once (at 30 inches per second) — what we call today full-track mono. The first tapes were far better than the equipment that used them, and the plastic- or acetate-backed gamma-ferric-oxide formulation remained the standard well into the '60s, when they were gradually replaced by the longer-lasting polyester bases.

By 1954, tape speed had come down to 15 ips, and even 7½ ips, while electronic and head-making technology had proved itself able to preserve sound quality at lower speeds. Designers also had developed recording and playback heads that could perform satisfactorily over only half the width of the tape. Now tape machines could record twice as much material on a roll of tape as before, and this half-track mono configuration was easily converted to stereo once the idea came along.

The first half-track stereo machines had two staggered sets of heads, each requiring separate alignment; it was an arrangement reminiscent of some early stereo-disc experiments, which used two cartridges and needles mounted on one bifurcated tone arm. As no one had decided on a standard for the spacing of the stereo heads, it was a happy day indeed when the in-line stereo head was developed. Crosstalk (channel separation) figures on the early heads were abominable, but since no one had any other stereo medium to compare them with, they sounded just fine.

By 1960, stereo records and FM had become a reality, and recorder manufacturers had discovered a way to double the playing time on a reel once again. With the track width halved one more time, recorders could get four tracks onto one tape. These could be four individual channels or two pairs of stereo programs.

Shrinking of the track width does not, as many people believe, interfere with the frequency response of the tape. What it does limit, however, is the dynamic range, and in order to preserve the dynamic range of the wider-track machines, the new quarter-track machines needed quieter electronics. It wasn't long before the electronics generated a lower noise level than the residual noise on the tape, and the track-width battle was pretty much over.

Meanwhile, the battle for longer recording times was still raging, and tape manufacturers, armed with the new polyester formulations (chemically known as polyethylene-terephthalate, and generally marketed under DuPont's trademark "Mylar"), discovered that these tapes could be made thinner than the old acetate ones without being as breakable. Whereas acetate tapes could, in practical terms, be no thinner than 1.5 mils (.0015 inch) before they would snap given the slightest provocation (which meant that about 1200 feet of tape would fit on the standard seven-inch-diameter reel), polyester tapes could easily be produced that were one mil thick, allowing 1800 feet on a reel. By subjecting the polyester to a prestretching process (resulting in what was called "tensilized Mylar"), manufacturers were able to use half-mil tape, and to get 3600 feet of it on a reel — so-called "triple-play" tape.

These extraordinarily thin tapes suffered from two serious drawbacks. Most obvious was the tapes' tendency to stretch under any kind of tension; somewhat more subtle were their poor print-through characteristics — sounds recorded on a short length of tape would bleed over onto the next layer of tape as it was all wound on the reel. These problems were serious enough to prevent audiophiles from taking the thin formulations seriously, and demand eventually dwindled.

The early quarter-track machines were hybrids; since the catchword of the times was "stereo" (even recording tape itself being sold as "stereo" — an absurdity on the face of it), many of these machines were equipped with a stereo playback head and advertised as being stereo speaker for the second channel, and the owners' manuals machines. Trouble was, there were no electronics or included complicated instructions on how to hook up a separate preamp and amplifier in order to recover the stereo program. Of course, the machines would not record in stereo, but the manufacturers made up for this deficiency by touting the virtues of the proceedure called "sound-on-sound" — recording one track, and then, after laboriously hooking the thing up to an outboard stereo system, recording the second one. Some machines even had primitive mixers built in, through which the recorded sound from the first channel could be routed along with the "live" second track, putting both signals onto one track. This process could, at least according to the manufacturers, be repeated indefinitely, allowing the user to record a whole orchestra, one instrument at a time. After the second or so time around, however, the residual noise on the tape would be built up to the point where the recordings would become unlistenable.

By this time, heads were developed that would serve adequately as both record and playback heads, and most tape machines on the home market used these. Professional machines had always used separate heads for the two functions, since the head gap, flux density, and several other physical and electrical characteristics of the ideal record head are quite different from those found on the ideal playback head. Home-tape-unit designers were not, however, selling to a particularly finicky market, and the separate-head designs (known as "three-head" machines — erase, record, and playback) remained out of the home market until around 1966, when they gradually began to take over.

While quarter-track heads were becoming the standard in consumer tape recorders, 3¾ ips was also being looked on as a way to expand the reel's capacity further. Makers of prerecorded reel-to-reel tapes, who had doggedly kept up with the various format changes over the years, went ahead with this one, too; home recordists, however, were beginning to feel the stirrings of concern about fidelity, and balked at recording their own important tapes at the lower speed — which did, indeed, seriously impair high-frequency response. Many recorder manufacturers went a step further, offering a 1⅞ ips speed, and a few even put on 15/16 ips, but no one pretended that these speeds were capable of decent music reproduction.

And so it has remained with reel-to-reel recorders to this day. After the introduction of Dolby noise-reduction, there was another brief flirtation with 3¾ ips by the prerecorded-tape manufacturers, and there was some excitement when quadraphonic looked as though it was about to revolutionize the audio industry. This prospect resulted in a vast number of four-channel, quarter-track decks being pushed onto the market, as reel-to-reel tape recorders already had the technology and standardization that would allow them to adapt to quad easily, whereas the various disc- and broadcast-equipment makers had to slug it out, eventually destroying their own market in the fracas. A few four-channel tape decks remain, but these are geared to the amateur recording engineer who wants to play with "sound-on-sound" recording, now referred to as multi-tracking. These machines generally include a synchronization circuit, which is an idea originally developed by Ampex for its professional machines. This circuit allows perfect synchronization between tracks recorded separately (which would ordinarily be extremely difficult, since the tape passes the record head and the playback head at different times), by temporarily making the record head into a less than ideal but still usable playback head on the track already recorded, thereby allowing real-time monitoring.

With the growth of professional multi-track recording beginning in the late '60s, wider tapes were introduced in order to accommodate the eight, 12, 16, 24, and finally 32 parallel tracks that the industry demanded. The largest practical width was found to be two inches, but that hasn't stopped the race for more tracks. One West Coast manufacturer makes a two-inch 40-track machine, while at the other end of the spectrum, half-inch eight-track machines become popular in the past two years. There is even a rumor abroad in England that quarter-inch eight-track is not long in coming.

The tape itself evolved slowly, with small improvements in the oxide formulas being introduced over the

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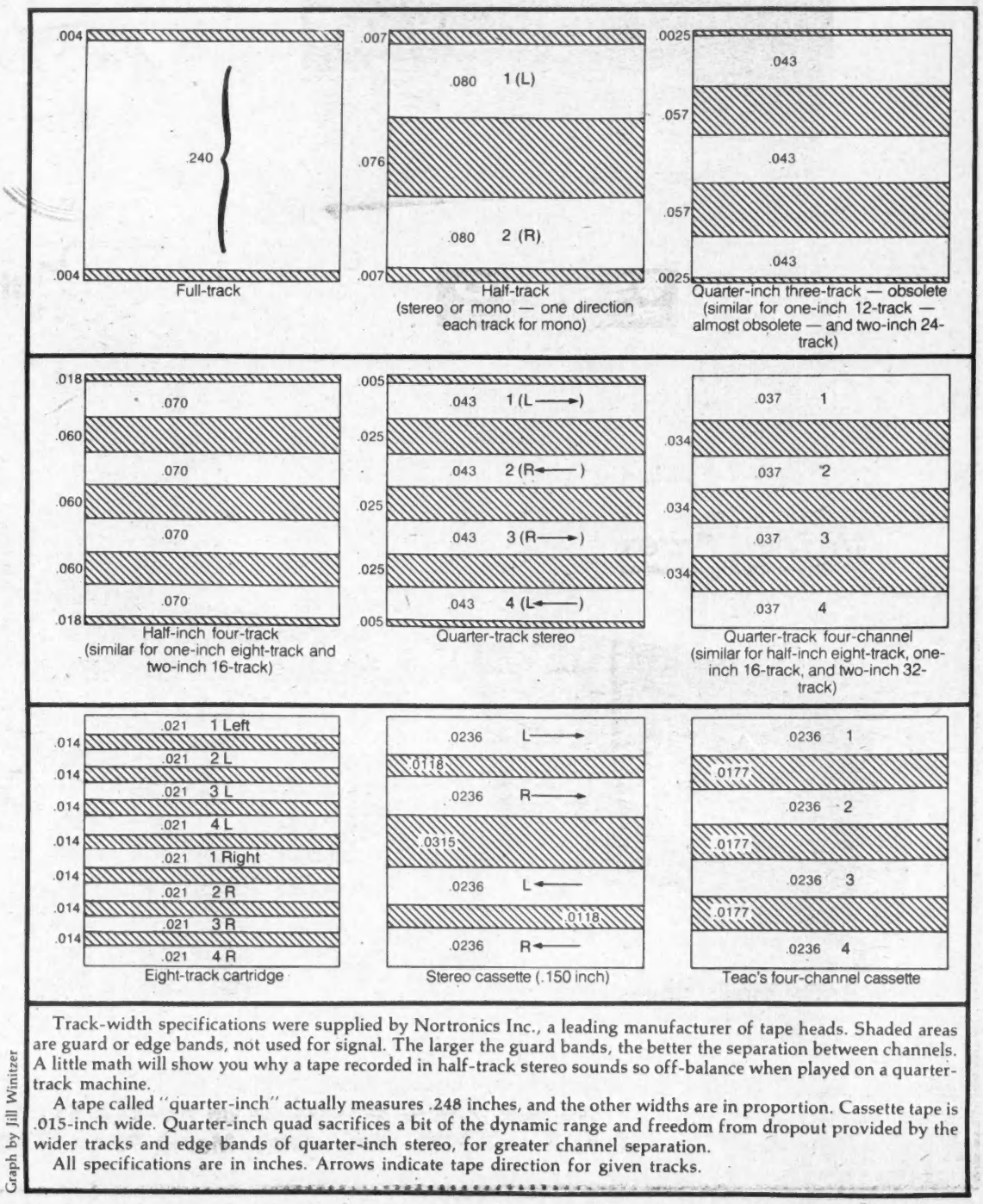

Graph by Jill Winitzer

Track-width specifications were supplied by Nortronics Inc., a leading manufacturer of tape heads. Shaded areas are guard or edge bands, not used for signal. The larger the guard bands, the better the separation between channels. A little math will show you why a tape recorded in half-track stereo sounds so off-balance when played on a quarter-track machine.

A tape called "quarter-inch" actually measures .248 inches, and the other widths are in proportion. Cassette tape is .015-inch wide. Quarter-inch quad sacrifices a bit of the dynamic range and freedom from dropout provided by the wider tracks and edge bands of quarter-inch stereo, for greater channel separation.

All specifications are in inches. Arrows indicate tape direction for given tracks.

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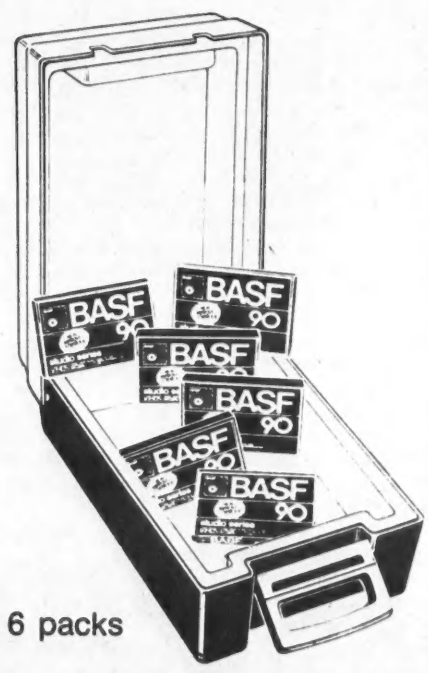

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**Winners will be announced on the Ken Shelton show,
10 A.M. — 2 P.M. Wednesday, March 19 on WBCN FM 104.**

A new Pioneer for Advent

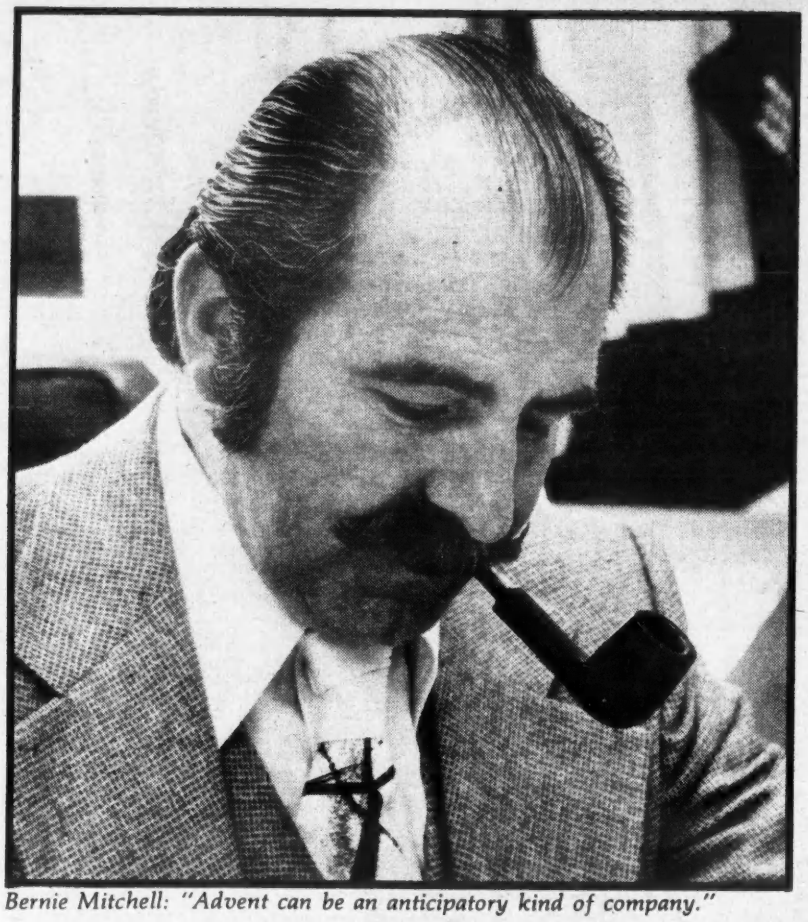
Bernie Mitchell and his move to New England

by Peter W. Mitchell

Bernie Mitchell joined US Pioneer in 1970, became its president in 1972, and supervised its dramatic growth from a minor brand to the largest-selling maker of hi-fi components. During the '70s, overall hi-fi-industry sales rose by a factor of about 10, while Pioneer's sales shot up by a factor of nearly 100. Pioneer's leap to dominance, and indeed the success of the whole industry, is attributed in part to Bernie Mitchell's aggressive and innovative use of advertising — in particular his decision to extend beyond the hi-fi-hobbyist magazines and use Pioneer's advertising to educate the general music-loving public about the virtues and pleasures of hi-fi components.

A few months ago, Mitchell quit Pioneer, and on February 1 it was announced that he had been appointed chief executive officer of Advent Corporation and vice-chairman of its board of directors. During the '70s, under the direction of founder Henry Kloss, Advent had been one of the nation's leading makers of loudspeakers, and had virtually single-handedly started the large-screen projection-TV industry. But in a financial squeeze a couple of years ago, business whiz Peter Sprague took over ownership and then active control of Advent from Kloss; many of Advent's creative talents left to start their own companies (Apt/Holman, Kloss Video, Boston Acoustics). Sprague made a controversial decision to close Advent's assorted factories in Cambridge, to lay off many long-term employees, and to open a new Advent factory in New Hampshire with freshly hired, lower-paid assembly-line workers. Lately, Advent's hi-fi sales have been slumping, and its dominance of the projection-TV industry is threatened by Mitsubishi, Panasonic, Sony, and GE. Is Bernie Mitchell a classic case of the right man connecting with the right company at the right time? Is his brand of dynamic, aggressive, imaginative marketing and product-planning the magic ingredient that Advent needs in order to recapture its lost leadership in hi-fi and to stave off the threat to its leadership in video?

In its August 30, 1977, issue, the *Phoenix* published a candid and lengthy interview with Bernie Mitchell, in which he discussed his pre-Pioneer career, his management of Pioneer's growth, his vision of hi-fi's future, and his national fund-raising campaign for the Metropolitan Opera Company. He revealed his plan for US Pioneer to establish a plant in this country to develop and manufacture high-technology audio/video products, and he forecast that the hi-fi and TV industries would gradually merge through such developments as video discs, large-screen TV, and stereo sound for TV, bringing to living rooms everywhere both the visual and the aural experience of a rock concert or an opera. Later this month, incidentally, Pioneer's present executives are expected to announce marketing plans for Pioneer's $1000 optical video-disc player, which uses the Magnavision laser playback system, has better resolution and color fidelity than video cassettes, features a stereo sound track, and can be used with an optional accessory decoder to play PCM digital audio discs.



Bernie Mitchell: "Advent can be an anticipatory kind of company."

A final note regarding this followup interview with Bernie Mitchell: so far as is known, the interviewee and interviewer are not related.

* * *

Q: *How did you come to leave Pioneer?*

A: Any brief explanation would have to be an oversimplification, of course. I'm an American. Pioneer's senior management is Japanese and always will be. If I were to continue to grow (and I wanted to, to talk about the destiny of the company, acquisitions, things like that), I would have to exercise powers that, in their way of thinking, only their Japanese executives do. I felt limited there, and it occurred to me that the very fine 10-year life cycle that I had with them was probably working itself out. After the regular meetings of Pioneer's international divisions last June, I thought about it and went back to Japan shortly afterward to talk to Pioneer. We discussed an orderly transition. In August, I became president *emeritus*, and I worked with them full-time as a consultant through November, before I began to taper off.

Q: *Speaking of acquisitions, was the purchase of Phase Linear by Pioneer*

Continued on page 40

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Music in the air

Michael Compion

A guide to live and live-on-tape FM concerts

compiled by Billy Pope

With all the hoopla over stereo products and sound engineering, it's easy to forget that the goal of audiophilia is the enjoyment of recorded and broadcast music. The Boston area is home to several dozen stations that feature all kinds of programing, from documentary to drama and from background pabulum through rock and jazz to the classics. Few cities offer so much worthwhile programing or encourage so many tape-deck owners to build off-the-air libraries of special concerts and performances. Yet even the most dedicated listener is bound to miss his or her share of the excellence. What follows, then, is a listing of noteworthy music scheduled to be broadcast between now and mid-May. (Performers' first names are given when available.) That the schedule appears to taper off later in the spring indicates mostly the difficulty of gathering listings so far in advance; generally, it does not mean that programs have ended. Details will be carried in "Airwaves," the weekly radio-listings column in the *Phoenix* Arts section.

Please note: if you simply pull this page out of this section without cutting anything, you'll find you have a self-contained, four-page book containing the entire schedule, suitable for setting on top of your tuner. Tricky, huh? — Ed.

WBUR 90.9 FM
WCRB 102.5 FM
WGBH 89.7 FM
WHRB 95.3 FM

MARCH

Saturday, March 8

1:00 (WGBH) Jazz Alive! A performance by Betty Carter from the Great American Music Hall.

2:00 (WCRB) Metropolitan Opera (live). James Levine conducts Berg's *Wozzeck*, with Behrens, van Dam, Cassilly, and Ulfung as soloists.

8:00 (WCRB and WGBH) BSO (live). Colin Davis conducts Schubert's Overture in D major, Schubert's **Symphony No. 4 (*Tragic*)**, and Brahms's Symphony No. 2.

10:00 (WGBH) Boston Globe Jazz Festival (live). The Freddie Hubbard Quintet and the Sonny Rollins Quartet in a concert from Berklee Performance Center.

Sunday, March 9

1:00 (WGBH) Boston Artists Ensemble. The Ensemble perform Mendelssohn's String Quartet in E minor.

2:00 (WGBH) The New England Women's Symphony. Featuring music conducted, composed, and performed by women, this concert includes works by Grimani, Howe, Perry, and Warren.

2:00 (WBUR) Sunday Opera. Herbert von Karajan directs a performance of Verdi's *Don Carlos*, with Carreras, Freni, Ghiaurov, and Baltsa as soloists.

3:00 (WHRB) Live at Passim. How To Change a Flat Tire in a performance of traditional music of Ireland.

6:00 (WBUR) Swedish Soloists. Pianist Janos Solyom performs Rachmaninoff's *Etudes-Tableaux*, Stenhammar's *Late Summer Nights*, Liszt's *Liebestraum* No. 2, and Stenhammar's Fantasia No. 1.

8:00 (WGBH) Boston Globe Jazz Festival (live). George Shearing and Bill Evans perform from the Berklee Performance Center.

8:00 (WHRB) New York City Opera Festival. Imre Pallo conducts the New York City Opera chorus and Orchestra in Rossini's *Count Ory*, with Blake, Putnam, and Ramey as soloists.

8:30 (WCRB) Sunday Evening at the Opera. Malcolm Sargent directs the D'Oyly Carte Opera Company in a 1930 performance of Gilbert and Sullivan's H.M.S. Pinafore. Harry Norris directs the D'Oyly Carte Opera Company in a 1927 performance of Gilbert and Sullivan's *Trial by Jury*, and Willy Mattes directs the Bavarian Radio Chorus and Symphony in Franz Lehar's *The Land of Smiles*.

10:00 (WGBH) Folk Festival, USA. "The Third National Women's Music Festival." Highlights from the 1976 festival from Champaign, Illinois, include performances by Holly Near, Annie Dinerman, Malvina Reynolds, and Betsy Rose.

Monday, March 10

8:00 (WCRB) GTE Concert Hour. Albert Beaucamp conducts the Rouen Chamber Orchestra in Purcell's *Abdelazer* (*The Moor Revenged*) Suite, and Alfred Deller conducts the Vienna Concentus Musicus in Purcell's *Dioclesian Masque*.

8:00 (WGBH) Boston Globe Jazz Festival (live). Concert sets by the World's Greatest Jazz Band, jazz tap dancer Honi Coles, the New Black Eagle Jazz Band, Dave McKenna, and Scott Hamilton.

8:00 (WHRB) Chamber Music. A recital of songs by Webern, Wolf, and Faure, and Clerambault's *Orphee* Cantata performed by a group of musicians featuring soprano Susan Davenny Wyner.

9:00 (WCRB) San Francisco Symphony. Leonard Slatkin conducts Colgrass's *Theatre of the Universe* and Prokofiev's *Ivan the Terrible*.

Tuesday, March 11

8:00 (WGBH) The Second Festival of Women's Music, part II. Pianist-composers Ruth Schonthal, Doris Hays, Marga Richter, and Judith Lang Zaimont perform their works.

8:00 (WCRB) GTE Concert Hour. David Epstein conducts the MIT Symphony in Copland's *Dance* Symphony and Hindemith's Viola Concerto (*Der Schwanendreher*), with Marcus Thompson as the soloist.

9:00 (WCRB) Chicago Symphony. Charles Mackerras conducts an all-Handel concert: a Suite from the *Water Music*, Concerto *A Due Cori*, and *Music for the Royal Fireworks*.

10:00 (WGBH) Boston Globe Jazz Festival (live). Muddy Waters and Roomful of Blues in concert.

11:00 (WBUR) Jazz Alive! From Rick's Cafe American in Chicago, the program features sets by trumpeter Warren Vache and tenor saxophonist Scott Hamilton and their quintet, by Polish pianist Adam Makowicz, and by veteran vocalist Sylvia Syms.

Wednesday, March 12

8:00 (WGBH) Boston Globe Jazz Festival (live). Carla Bley and the Fringe in a performance from the Berklee Performance Center.

8:00 (WCRB) GTE Concert Hour. A performance of Cherubini's Requiem in D minor by the Ambrosian Singers and the New Philharmonia Orchestra, Riccardo Muti conducting.

9:00 (WCRB) Cleveland Orchestra. Sixten Ehrling conducts Vaughan Williams's Tuba Concerto, with Ronald Bishop, Vaughan Williams's Symphony No. 5, and Stravinsky's *Le Sacre du Printemps*.

Thursday, March 13

Noon (WGBH) MusicAmerica (live). A performance by the Gil Graham Trio, featuring vocalist Yvette Cason.

8:00 (WCRB) GTE Concert Hour. Beck performs Chadwick's Pastorale for Organ in E-flat, and Drueger conducts the Royal Philharmonic in Chadwick's Symphony No. 2.

9:00 (WCRB) New York Philharmonic. Zubin Mehta conducts Brahms's Piano Concerto No. 1, with

Continued on page 12

Concerts

Continued from page 11

Andre Watts, and Berlioz's *Symphonie Fantastique*.
11:00 (WBUR) Jazz at the Church. The fusion of Ictus in concert.

Friday, March 14
2:00 (WGBH) BSO (live). Colin Davis conducts Schumann's Piano Concerto in A minor, with Claudio Arrau, and Schubert's Symphony No. 9. Repeated on WGBH and WCRB, Saturday, March 15, at 8 p.m.
8:00 (WGBH) The Samuel Barber Tribute Concert. Calvin Simmons conducts the Curtis Symphony Orchestra in an all-Barber concert: *School for Scandal, Knoxville: Summer of 1915, Essay No. 2,* and Violin Concerto.
8:00 (WCRB) GTE Concert Hour. Marks performs Five Caprices for Piano by Carlos Chavez, and Eduardo Mata conducts the New Philharmonia Orchestra in Chavez's Piano Concerto, with Rodriguez as soloist.
9:00 (WCRB) BSO Retrospective. William Steinberg conducts Richard Strauss's *Till Eulenspiegel's Merry Pranks*, Seiji Ozawa directs Respighi's *Pines of Rome*, Colin Davis conducts Sibelius's *Finlandia*, and Arthur Fiedler conducts Dvorak's Symphony No. 9 (*From the New World*).
10:00 (WGBH) Boston Globe Jazz Festival (live). Dizzy Gillespie and Carmen McRae in a concert from the Berklee Performance Center.

Saturday, March 15
1:00 (WGBH) Jazz Alive! From the 1978 New Year's Eve concert from San Francisco's Keystone Korner, performances by the Freddie Hubbard Septet with Joe Anderson, the Charles McPherson Quartet, and Leon Thomas.
1:00 (WCRB) Metropolitan Opera (live). James Levine directs Verdi's *Don Carlos*, with Cruz-Romo, Obraztsova, Giacommini Milnes, Plishka, and Cheek as soloists.
8:00 (WCRB and WGBH) BSO (live). See Friday, March 14, at 2 p.m.
10:00 (WGBH) Boston Globe Jazz Festival (live). A Latin-jazz program featuring Eddie Palmieri, Dizzy Gillespie, and Dimension Latina.

Sunday, March 16
1:00 (WGBH) Boston Artists Ensemble. The Ensemble perform Mozart's *Dissonant* String Quartet.
2:00 (WBUR) Sunday Opera. Tatiana Kolomijzeva directs this performance of Taneyev's *Oresteia*, with Tschernobajew, Galushkina, and Bokow as soloists.
3:00 (WGRB) Live at Passim. Rosalie Sorrels, the gravel-throated hummingbird, in a concert performance.
6:00 (WBUR) Swedish Soloists. Kjell-Inge Stevensson, clarinet, performs Stravinsky's Three Pieces for Clarinet, Rautavaara's Sonetto for Clarinet and Piano, excerpts from Nielsen's Clarinet Concerto, and Shchedrin's *Basso Ostinato*.
7:30 (WGBH) Folk Heritage (live). From the Fifth Annual St. Patrick's Day Party at Philadelphia's Cherry Tree Folk Club, a concert of traditional Irish music, featuring Mick Moloney, Eugene O'Donnell, Liz Carroll, Father Charlie Cohn, and Timmy Britton.
8:00 (WHRB) New York City Opera Festival. Sarah Caldwell conducts the New York City Opera chorus and Orchestra in Verdi's *Falstaff*, with Gramm, Hegierski, Costa-Greenspon, and Fredericks as soloists.
8:30 (WCRB) Sunday Evening at the Opera. Hans Schmidt-Isserstedt directs the Dresden State Orchestra and the Leipzig Radio Chorus in Mozart's *Idomeneo*, with Gedda, Moser, Rothenberger, Schreier, and Adam as soloists.
10:30 (WGBH) Folk Festival, USA. "The Second Annual Bread and Roses Festival of Acoustic Music." From the Greek Theatre in Berkeley, highlights from this 1978 benefit concert with Kenny Rankin, the Persuasions, and Hoyt Axton.

Monday, March 17
11:00 a.m. (WGBH) Live Performance Series. How To Change a Flat Tire perform their own arrangements of traditional Irish music.
8:00 (WGBH) Chamber Music from the Library of Congress. Edith Peineman, violin, Walter Klien, piano, and a wind ensemble directed by Frederick Prausnitz perform Beethoven's Sonata No. 2, Schumann's Sonata in A minor, and Berg's Chamber Concerto.
8:00 (WCRB) Concert Hour. Kaufman directs the Friends of Dr. Burney Ensemble in Burney's *The Cunningman* (after Rameau).
9:00 (WHRB) Chamber Concert. The Boston Symphony Chamber Players perform Schubert's Trio in B-flat, Reinecke's Trio in A minor, Debussy's *Prelude to the Afternoon of a Faun*, and Stravinsky's *L'Histoire du Soldat* Suite.

Tuesday, March 18
8:00 (WGBH) Second Festival of Women's Music, part III. The DaCapo Chamber Players, featuring pianist Joan Tower, perform works by women composers, including Diane Thomas, Lili Boulanger, and Joan Tower.
8:00 (WCRB) Concert Hour. Leonard Shure, piano, performs Schubert's *Wanderer* Fantasy and the Piano Sonata in C minor.
9:00 (WCRB) Chicago Symphony. Georg Solti conducts Mozart's Flute Concerto No. 2, with Donald Peck, and Bruckner's Symphony No. 5.
9:00 (WHRB) Evening Concert. A London Symphony Orchestra performance of Bach's Mass in B minor, with Schumann, Balfour, and Widdop as soloists.
11:00 (WBUR) Jazz Alive! Alto saxophonist Arthur Blythe and his quartet perform from the Public Theatre in New York City, pianist/composer Horace Tapscott and Arkestra perform from Los Angeles, and pianist/composer Ran Blake performs a solo set.

Wednesday, March 19
8:00 (WGBH) NPR Recital Hall. Tashi, a chamber-music ensemble formed by pianist Peter Serkin, perform Brahm's Clarinet Trio, Mozart's Sonata for Piano and Violin in G major, and the *Tashi* Quartet, a work composed for the ensemble by Peter Lieberson.
8:00 (WCRB) Concert Hour. The Collegium Aureum perform C.P.E. Bach's Double-Harpsichord Concerto, with Leonhardt and Curtis, and Haydn's Sinfonia Concertante.
9:00 (WCRB) Cleveland Orchestra. Matthias Bamert conducts his *Keepsake*, Beethoven's Piano Concerto No. 1, with Radu Lupu, and Schumann's Symphony No. 1 (*Spring*).

Thursday, March 20
8:00 (WCRB) Concert Hour. Jorge Mester conducts the Louisville Orchestra in Foote's *Francesca da Rimini*, and Drueger conducts the Royal Philharmonic Orchestra in Foote's Suite in D minor.
9:00 (WCRB) New York Philharminic. Zubin Mehta conducts Haydn's Symphony No. 95, Kim's Violin Concerto (world premiere), with Itzhak Perlman, Haydn's Symphony No. 96 (*Miracle*), and Wieniawski's Violin Concerto No. 2, also with Perlman.
11:00 (WBUR) Jazz at the Church (live). Original jazz compositions by Mark Polishook and Ken Filiano.

Friday, March 21
Noon (WGBH) MusicAmerica. A playing of the historic Benny Goodman Carnegie Hall jazz concert of 1938.
8:00 (WGBH) Ludwigsburg Festival. "A Concert by Igor Kipnis." The harpsichordist's performance includes Couperin's Suite in G minor, Duphly's Chaconne in F major, Froberger's Suite No. 26, Haydn's Capriccio in D major, and Handel's *Harmonious Blacksmith*.
8:00 (WCRB) Concert Hour. Igor Kipnis performs Bach's Harpsichord Partita No. 6, and Karl Muenchinger conducts the Stuttgart Chamber Orchestra in Bach's Harpsichord Concerto No. 6, with Kipnis the soloist.

Saturday, March 22
1:00 (WGBH) Jazz Alive! See Tuesday, March 4, at 11 p.m.
2:00 (WCRB) Metropolitan Opera (live). From Lincoln Center, Nicola Rescigno directs Donizetti's *Don Pasquale*, with Cotrubas, Trimarchi, Rendall, and Duesing as principal soloists.
8:00 (WGBH) The Syracuse Symphony Orchestra from Carnegie Hall (live) Christopher Keene conducts a premiere of Roger Sessions's Symphony No. 9, Keith Jarrett's Piano Concerto, with Jarrett as soloist, and Schuman's Symphony No. 3

Sunday, March 23
1:00 (WGBH) Boston Artists Ensemble. The Ensemble perform Schubert's String Quartet No. 13.
2:00 (WBUR) Sunday Opera (live). The Metropolitan Opera National Audition Finals from the Met.
3:00 (WHRB) Live at Passim. Billy Novick and Guy van Duser perform their versatile ragtime and folk.
6:00 (WBUR) Swedish Soloists. Soprano Elisabeth Soederstroem sings Rachmaninoff Songs ("In the Silent Night," "So Many Hours," "A Dream," "Spring Waters," "Arion") and Norheim's "Evening Land."
7:30 (WGBH) Folk Heritage (live). Singer, songwriter, and guitarist Dick Pinney from Joffrey, New Hampshire, performs a set.
8:00 (WHRB) New York City Opera Festival. Charles Wendelken-Wilson conducts the New York City Opera Chorus and Orchestra in Bizet's *Carmen*, with de los Angeles, Calleo, and Hale as soloists.
8:30 (WCRB) Sunday Evening at the Opera. Georges Pretre directs the Paris Opera Chorus and Orchestra in Bizet's *Les Pecheurs de Perles*, with Cotrubas, Vanzo, Arabia, and Soyer as soloists.
10:30 (WGBH) Folk Festival, USA. "A Prairie Home Companion All-Star Review." The Powdermilk Biscuit Band, Thelman Buchner, and the Minnesota Gospel Twins, Claudia Wagner, and others perform old-timy, gospel, jazz, ethnic, and folk music.

Monday, March 24
8:00 (WGBH) Chamber Music from the Library of Congress. Ruggiero Ricci, violin, and Mitchell Andrews, piano, perform Bach's Partita No. 2 in D minor, Franck's Sonata in A major, Baker's Jazz Suite for Violin and Piano (premiere), and Ysaye's Sonate No. 3 in D minor.
8:00 (WCRB) Concert Hour. Andre Previn conducts the London Symphony Orchestra and Chorus in Britten's *Spring* Symphony.
9:00 (WCRB) San Francisco Symphony. Edo de Waart conducts Ruggles's *Sun-Treader*, Mendelssohn's Violin Concerto, with Shlomo Mintz, Leeuw's *Mouvements Retrogrades*, and Ravel's *La Valse*.

Tuesday, March 25
8:00 (WGBH) Second Festival of Women's Music, part IV. The Rogeri Trio perform works by Louise Farrene, Rebecca Clarke, and Karen Hoover.
8:00 (WCRB) Concert Hour. A performance of the Central Philharmonic Society's *Yellow River* Concerto, with Ilana Vered as piano soloist; Julian Bream, guitar, and tenor John Pears perform *Songs from the Chinese* by Benjamin Britten; and Seiji Ozawa conducts the BSO in Liszt's Piano Concerto No. 1, with Liu Shih-Kun.
9:00 (WCRB) Chicago Symphony. Yevgeny Svetlanov conducts Tchaikovsky's Piano Concerto No. 1, with Alexis Weissenberg, and Rimsky-Korsakov's *Scheherazade*.
11:00 (WBUR) Jazz Alive! From the 1979 Montreux Jazz Festival, performances by soulful saxophonist Grover Washington Jr. and his group, the fusion jazz of the Jasper Van't Hof Quartet, and a set by guitarist Lee Ritenour.

Wednesday, March 26
8:00 (WCRB) Concert Hour. Bruno Walter conducts the Columbia Symphony Orchestra in Brahms's *Song of Destiny*, with Mildred Miller as soloist, and Strauss's *Emperor* Waltz, and he directs the Vienna Philharmonic in Mahler's *Kindertotenlieder*, with Kathleen Ferrier as soloist.
9:00 (WCRB) Cleveland Orchestra. Aldo Ceccato conducts Mozart's *Marriage of Figaro* Overture, Mozart's Violin Concerto No. 5 (*Turkish*), with Franco Gulli, and Tchaikovsky's *Manfred* Symphony.

Thursday, March 27
3:30 (WGBH) MusicAmerica (live). The keyboard jazz of Bob Winter and Ray Santisi in a live performance.
8:00 (WCRB) Concert Hour. Norman Dello Joio performs his own Variations and Capriccio for Piano and Violin, with Travers on violin; Buckley conducts the US Coast Guard Band in Dello Joio's *Satiric Dances*; and Silverstein conducts the Boston University Symphony in Dello Joio's *Meditations on Ecclesiastes*.
9:00 (WCRB) New York Philharmonic. Zubin Mehta conducts Tal's Symphony No. 3 (US premiere), Chopin's Piano Concerto No. 2, with Krystian Zimerman, and Saint-Saens's Symphony No. 3 (*Organ*).
11:00 (WBUR) Jazz at the Church. A concert performance of the Rene Arlan Trio.

Friday, March 28
2:00 (WGBH) BSO (live). George Cleve directs the BSO and the Tanglewood Festival Chorus in Gluck's *Orfeo ed Euridice*, with Marshall as principal soloist. Repeated Saturday, March 29, at 8 p.m. on WGBH and WCRB.
8:00 (WCRB) Concert Hour. Clark performs Barber's Cello Sonata, and Goehr conducts the Lucerne Festival Orchestra in Barber's Violin Concerto, with Kaufman as soloist.

Saturday, March 29
2:00 (WCRB) Metropolitan Opera (live). Live from Lincoln Center, James Levine directs Puccini's *Manon Lescaut*, with Scotto, Domingo, Elvira, Capecchi, Creech, and Jones as principal soloists.
8:00 (WGBH and WCRB) BSO (live). See Friday, March 28, at 2 p.m.

Sunday, March 30
1:00 (WGBH) Boston Artists Ensemble. The Ensemble perform Mendelssohn's Piano Trio in D.
2:00 (WBUR) Sunday Opera. Karl Boehm directs this performance of Mozart's *Idomeneo*, with Mathis, Varady, Ochman, and Schreier as soloists.
3:00 (WHRB) Live at Passim. A folk concert by David Buskin and Robin Batteau.
6:00 (WBUR) Swedish Soloists. Mezzo-soprano Edith Thallaug performs Salud's aria from Act I of Falla's *La Vida Breve*, Five Songs by Sinding, "Oh Don Fatale" from Verdi's *Don Carlo*, and Rosina's Cavatina from Rossini's *Barber of Seville*.
8:00 (WGBH) Folk Heritage. "Spring Fever Finale." A concert performance by Mary McCaslin and Jim Ringer.
8:00 (WHRB) New York City Opera Festival. Julius Rudel conducts the New York City Opera Chorus and Orchestra in Mozart's *La Clemenza di Tito*, with Moser, Vaness, and Murray as soloists.
8:30 (WCRB) Sunday Evening at the Opera. Herbert Blomstedt directs the Dresden State Orchestra and Leipzig Radio Chorus in Beethoven's *Leonore* (the original, 1805, version of *Fidelio*), with Moser, Donath, Cassilly, Adam, and Ridderbusch as soloists.

Monday, March 31
8:00 (WGBH) Chamber Music from the Library of Congress. The Juilliard String Quartet, with pianist Richard Goode, perform Brahms's String Quartet No. 3, Joachim's Variations for Viola and Piano, and Schumann's Piano Quintet in E-flat.
8:00 (WCRB) Concert Hour. Neville Marriner conducts the Academy of St. Martin-in-the-Fields in Holst's *St. Paul's Suite*, and William Hall directs his Chorale and String Orchestra in Effinger's *Paul of Tarsus*.
9:00 (WCRB) Baltimore Symphony. Sergiu Comissiona conducts Barber's *Medea: Meditation and Dance of Vengeance*, Rachmaninoff's Piano Concerto No. 3, with Horacio Gutierrez, and Shostakovich's Symphony No. 1.
9:00 (WHRB) Chamber Concert. Cellist Janos Starker and pianist Menahem Pressler perform a recital of Brahms's Sonata in E minor, Beethoven's Twelve Variations on a Theme from Handel's *Judas Maccabeus*, Grieg's Sonata in A minor, and Brahms's Quartet in G minor, with Gulli and Primrose.

APRIL

Tuesday, April 1
11:00 a.m. (WGBH) Live Performance Series. Ruth Robinow, viola, Sanford Sylvan, baritone, and others present sacred and secular music.
8:00 (WCRB) Concert Hour. Peter Schickele conducts the New York Pick-Up Ensemble in a performance of his own *Eine Kleine Nichtmusik*, and he conducts the Ensemble and the Duh Brooklyn Boys' Chorus in P.D.Q. Bach's *Missa Hilarious*.
9:00 (WCRB) Chicago Symphony. Gunther Schuller conducts his Double-Bass Concerto, with Joseph Guastafeste as soloist, and Gennady Rozhdestvensky conducts Haydn's *Seven Last Words of Christ*.
11:00 (WBUR) Jazz Alive! From the Great American Music Hall in San Francisco, alto saxophonist John Handy performs with Rainbow, pianist Art Lande and his versatile band Rubisa Patrol perform, and then they are joined by bassist Charlie Haden.

Wednesday, April 2
8:00 (WCRB) Concert Hour. Peloquin performs his own *Contemplation* with organ, and he conducts the Peloquin Chorale and Orchestra in his *Lyric Liturgy*.
9:00 (WCRB) Cleveland Orchestra. Lorin Maazel conducts an all-Richard Strauss program: *Metamorphosen, Don Juan*, and *Le Bourgeois Gentilhomme*.

Thursday, April 3
Noon (WGBH) MusicAmerica (live). Voices, a jazz group from the Berklee College of Music, perform from the studio.
8:00 (WCRB) Concert Hour. Pearlman performs Couperin's *23rd Ordre for Harpsichord* and conducts the Banchetto Musicale in Telemann's Overture in D major and his Flute Concerto in E minor, with Joyce as the soloist.
9:00 (WCRB) New York Philharmonic. Zubin Mehta conducts Vivaldi's Quadruple Violin Concerto in B-flat, Hindemith's *Trauermusik*, Tomasi's Trumpet Concerto, Mozart's Flute Concerto in G major, Strauss's Horn Concerto No. 1, and Rimsky-Korsakov's *Capriccio Espagnol*.
1:00 a.m. (WCRB) Through the Night, "Good-Friday-Morning Special." Harnocourt conducts the Concentus Musicus and the Vienna Boys' Choir in Bach's *St. Matthew Passion*.

Friday, April 4
2:00 (WGBH) BSO (live). Vladimir Ashkenazy conducts Sibelius's Violin Concerto, with Joseph Silverstein, and Tchaikovsky's *Manfred* Symphony. Repeated on WCRB and WGBH Saturday, April 5, at 8 p.m.
8:00 (WCRB) Concert Hour. Rolf Schweizer conducts the Pforzheim Chamber Orchestra in Buxtehude's cantata cycle *Membra Jesu Nostri*.

Saturday, April 5
1:00 (WCRB) Metropolitan Opera (live). James Levine directs Wagner's *Parsifal* from Lincoln Center, with Troyanos, Thomas, Hines, and Plishka as principal soloists.
8:00 (WCRB and WGBH) BSO (live). See Friday, April 4, at 2 p.m.

Sunday, April 6
1:00 (WGBH) Boston Artists Ensemble. The Ensemble perform Bartok's String Quartet No. 3 (1927).
2:00 (WBUR) Sunday Opera. Hans Knappertsbusch conducts the Bayreuth Festival Orchestra in Wagner's *Parsifal*, with Thomas, London, Hotter, Dalis, and Neidlinger as soloists.
3:00 (WHRB) Live at Passim. The contemporary sound of DO'A in a concert performance.
8:30 (WCRB) Sunday Evening at the Opera. In a Delta Opera House performance, Alain Lombard directs Delibes's *Lakme*, with Mesple, Burles, and Soyer as soloists.

Monday, April 7
8:00 (WCRB) Concert Hour. Gonnenwein conducts the South German Madrigal Choir and Chamber Orchestra in Bach's *Easter* Oratorio.
9:00 (WCRB) Baltimore Symphony. Sergiu Comissiona conducts Gabrieli's Canzona No. 27, Bartok's *Music for Strings, Percussion and Celesta*, and Chopin's Piano Concerto No. 1, with Alexis Weissenberg.
9:00 (WHRB) Choral Concert. Jameson Marvin directs the Harvard Glee Club in a program of Renaissance Music.

Tuesday, April 8
8:00 (WCRB) Concert Hour. Pittman conducts the Boston Musica Viva in Mekeel's *Corridors of Dream*; Cirillo, violin, performs Mekeel's *Planh*; also, a performance of Beach's Piano Quintet in F-sharp.
9:00 (WCRB) Chicago Symphony. Georg Solti conducts Elgar's *In the South* Overture, Beethoven's Piano Concerto No. 4, with Vladimir Ashkenazy, and Elgar's *Falstaff* Symphonic Study.
11:00 (WBUR) Jazz Alive! "A Salute to Charles Mingus." The program features performances by Charles Mingus and by musicians who knew and loved his music, including a duo with singer Joni Mitchell and pianist Herbie Hancock, and the Mercer-Ellington Orchestra.

Wednesday, April 9
8:00 (WCRB) Concert Hour. McCabe performs Haydn's Piano Sonata No. 11 in B-flat, and the Aeolian Quartet perform Haydn's String Quartet in G major.
9:00 (WCRB) Cleveland Orchestra. Lorin Maazel conducts Mozart's Symphony No. 38 (*Prague*), Mozart's Piano Concerto No. 17, with Nathalie Bera-Tagrine, and Rimsky-Korsakov's *Capriccio Espagnol*.

Thursday, April 10
Noon (WGBH) MusicAmerica (live). Rose Weaver and the Greg Warson Trio perform live in the studio.
8:00 (WCRB) Concert Hour. Leonard Bernstein performs Copland's Piano Sonata, his own *Seven Anniversaries*, and conducts the New York Philharmonic in Mozart's Triple Piano Concerto in F major, with Gold, Fizdale and Bernstein as soloists.
9:00 (WCRB) New York Philharmonic. Zubin Mehta conducts Beethoven's *Leonore* Overture No. 3, Bartok's Concerto for Orchestra, and Tchaikovsky's Piano Concerto No. 1, with Emil Gilels.

Friday, April 11
2:00 (WGBH) BSO (live). With John Oliver directing the Tanglewood Festival Chorus, Seiji Ozawa conducts Mendelssohn's *Elijah*, with Ameling, Killebrew, Shicoff, and Milnes as soloists. Repeated on WCRB and WGBH on Saturday, April 12, at 8 p.m.
8:00 (WCRB) Concert Hour. Zukovsky performs Ives's Violin Sonata No. 1, Parker, baritone, sings Ives's song "The Camp Meeting," and Michael Tilson Thomas conducts the BSO in Ives's *Three Places in New England*.

Saturday, April 12
11:00 a.m. (WGBH) Live Performance Series. Nellie Ben-Or, pianist and professor at the Guildhall School of Music, performs from the studio.
2:00 (WCRB) Metropolitan Opera (live). From Lincoln Center, James Levine directs a new production of Mozart's *Abduction from the Seraglio*, with Eda-Pierre, Battle, Alexander, Atherton, and Berberian as soloists.
2:00 (WBUR) World Concert Hall. The Philadelphia String Quartet per-

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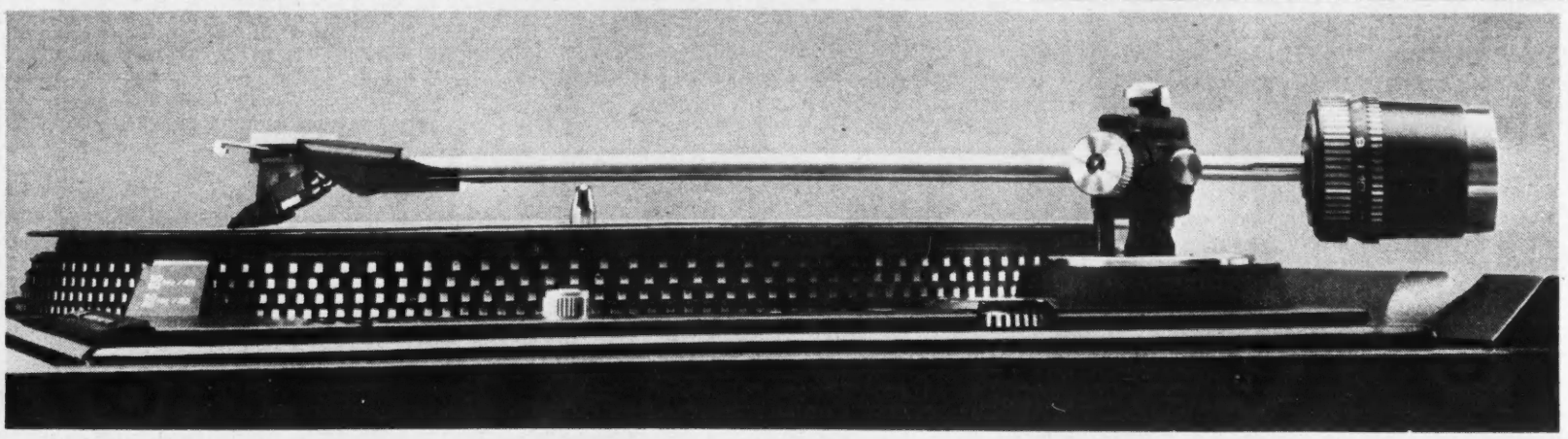

All your records will sound better with Dual's new ULM tonearm and cartridge system.

Even if they look like this.

Although none of your records may be in such bad shape, many are probably warped enough to present serious problems to conventional turntables.

The high inertia of a typical tonearm and cartridge combination, with approximately 18 grams total effective mass, causes the stylus to dig in riding up the warp and to take off on the way down. Tracking angle and tracking force vary widely—as much as 30 percent. And a warp as small as 1.5mm (which is barely discernible) can generate harmonic distortion of 2.7 percent. That's audible!

These problems have now been solved by Dual's new Ultra Low Mass tonearm and cartridge system.

The potential for this solution has existed ever since the development of Dual's dynamically-balanced tonearm with its gyroscopic gimbal suspension and straight-line tubular design.

Dual's research into the effects of mass on record playback led to a collaboration with Ortofon. A cartridge was developed with substantially less mass than any in existence. It weighs just 2.5 grams, including mounting bracket and hardware.

At the same time, the mass of the Dual tonearm was further reduced so that a perfectly matched tonearm and cartridge system emerged. Its total effective mass is just 8 grams. That's less than half the mass of conventional tonearm and cartridge combinations.

Tracking a record with the same 1.5mm warp, the ULM system reduces harmonic distortion to only 0.01 percent. That's 270 times less than that produced by the conventional tonearm and cartridge.

Not only is the overall sound audibly improved, but stylus and record life are significantly extended.

To experience the demonstrable advantages of ULM, bring a badly warped record to your Dual dealer. Listen to it played with the ULM tonearm and cartridge. (All nine new Dual turntables feature this system.)

You will hear the difference that ULM can make on all your records.

ULM.

A major breakthrough in record playback technology.

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MASSACHUSETTS

Auburn
The Value House

Boston
Tech HiFi
Tweeter, Etc.

Brockton
Tech HiFi
Tweeter, Etc.

Burlington
The Value House

Cambridge
Brands Mart
(closed door showroom, admission by Brands Mart Card or College I.D.)
A.Smith Div. of Wolf & Smith
Tech HiFi
Tweeter, Etc.

Chestnut Hill
Tweeter, Etc.

Dedham
Tech HiFi

Fitchburg
Fitchburg Music

Framingham
Tech HiFi
Tweeter Etc.

Hanover
Olde Colony Stereo
Tech HiFi

Haverhill
The Value House

Hyannis
Nantucket Sound

Natick
Olde Colony Stereo

Needham
You-Do-It

North Attleboro
Audio Concepts

North Dartmouth
Nantucket Sound
It HiFi

Quincy
Olde Colony Stereo
Tech HiFi

Saugus
Tech HiFi

Stoneham
Tech HiFi

Swansea
Nantucket Sound

Waltham
Tech HiFi
Waltham Camera & Stereo

Watertown
K&L Sound

Wellesley
Auditus

Worcester
HiFi House
Hearing Things
Tech HiFi

NEW HAMPSHIRE

Claremont
Radio Shack

Dover
Tech HiFi
The Value House

Franklin
Bi-Rite Mdsers.

Hanover
Tech HiFi

Keene
Melody Shop
Radio Shack

Manchester
Bi-Rite Mdsers.
Campus HiFi
Manchester Music
J. Robert Barry
Tech HiFi
Treisman's
Tweeter Etc.

Nashua
Tech HiFi
Treisman's

Salem
Cuomo's
Audio Market

RHODE ISLAND

Kingstown, R.I.
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Providence
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Apex, Inc.
Tech HiFi

Woonsocket
Audio Concepts
Auclair's Home Appliance

Ground control to NPR

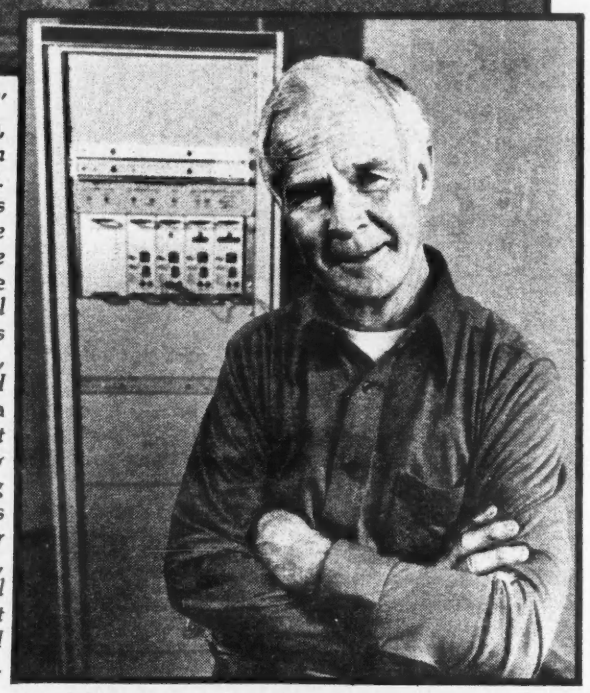
Satellite technology brings heavenly voices to WBUR

by Larry Collins

It glistens white in the winter sun, 20 feet tall, standing motionless on three powerful steel legs in a vacant lot not far from the Radio Shack building on Commonwealth Avenue near BU. It is a silent sentinel, overlooking the Turnpike, its gaze fixed on a point low over the southern horizon — a point in space, 22,000 miles above Ecuador and Venezuela.

With a change of a few words here and there this could be a description of one of the Martian machine-monsters in Orson Welles's 1938 broadcast of "War of the Worlds" on the CBS Radio Network. It's not, of course, but there is a connection. That broadcast caused a national shiver that is remembered four decades later because in 1938 the nation was united in its dependence on the radio networks as its prime source of news and entertainment. And the white sentinel on metal legs is the key to a new effort to re-establish a radio network, with modern technology, as a major source of entertainment and public-affairs information. The network is NPR, National Public Radio, and the metal monster is WBUR's satellite receiving antenna, which went into operation about six weeks ago. The network will carry NPR's usual range of cultural features, congressional debates, and live concerts of all kinds of music distributed nationally in full-fidelity stereo; ironically, it will also be used this year to bring listeners another science-fiction classic. About which more later.

Photos by Michael Grecco



The NPR "downlink" dish near BU (above), and WBUR's Jim Bonney (right). WGBH has completed its satellite "uplink" and will use it to broadcast Globe *Jazz Festival performances live this week, and on April 4, at 8 p.m., WGBH will broadcast* via *satellite a live concert of the Handel & Haydn Society doing Bach's* St. John's Passion, *and on Easter Sunday, at 2 p.m., will broadcast digital tape recordings of last December's H&H* Messiah.

Remember network radio? When our parents were our age, network radio was at the peak of its popularity and power. NBC, CBS, and the Mutual network competed vigorously, with heavy daily schedules of news, commentary, soap operas, comedy, adventure dramas, Westerns, mysteries, variety shows, popular crooners, and classical music. Since network radio was a mass medium, perhaps the most surprising thing about it, to today's listeners, was its willingness to devote substantial amounts of nationwide broadcast time to classical music. For example, Arturo Toscanini had a successful career conducting operas at La Scala and symphonies with the New York Philharmonic, but he didn't really become a household name until NBC hired him to conduct a weekly broadcast concert with a virtuoso orchestra formed just for the purpose — the NBC Symphony.

In the 1950s, mass-market television came along and the soap operas, comedies, Westerns, mysteries, and dramas moved into the new medium. Thousands of radio stations soon found that they could no longer depend on networks to supply them with entertaining programs to fill 10 or 15 hours each day. So the major manufacturers of records stepped in to fill the vacuum, and the disc jockey was born. By providing a pile of free records to every local station, the record-makers solved the stations' biggest worry — how to fill airtime cheaply — and at the same time gain an enormous amount of exposure for their product; it was perhaps the greatest advertising bargain in the history of American business. The broadcasting business was transformed. Musical programing was no longer governed by the tastes of educated executives and programers in New York and Chicago; every DJ was his own programer. The records he played depended on local tastes, his own preferences, and — most important — the persuasive abilities of the distributors who stopped in every week with the records they wanted their jockeys to play. It didn't take long for their persuasions to graduate from free meals and vacation trips to sex, booze, drugs, and outright bribes, at least until payola became a household word — and a public scandal — in the late '50s.

From the point of view of the record companies, radio broadcasting had become an ideal (and practically free) way of exposing their product to potential buyers. It didn't take them very long to figure out that in the '50s, teenagers had more discretionary income than housewives did. And since they had acquired effective control over the programing of many radio stations, record companies had the merchandising vehicle they needed to reach and influence that teenage market. Top-40 radio shows, which had been an occasional feature reflecting actual record sales and jukebox requests, spread across the dial and spread the rock 'n' roll revolution. If it had not been for the collapse of network radio and the consequent rise of stations that functioned simply as players of records, record companies would have found it much more difficult to gain instant nationwide exposure for each week's new dance step and new candidate for teen stardom; Fabian and Chubby Checker might still have made it to the top, but it would have taken them longer.

The idea that a radio station could exist and operate simply as a big commercial record player was indeed a crucial conceptual innovation in the broadcasting business. Radio traditionally had functioned as a transmitter of "actualities": whatever you heard coming from your radio speaker was actually occurring someplace. If a broadcast wasn't "live" but was from a recording, that fact was always carefully announced; in the early '50s, for instance, the Roy Rogers show (Thursday evenings at 7:30) invariably ended with the tag line, "The preceding program was transcribed," *i.e.*, recorded. When Bing Crosby began using tape recorders, allowing delayed airing of broadcasts, it was simply a means to avoid having to do his evening show twice — once for the East Coast, again for the West Coast three hours later. But the format and "feel" of recorded programs remained the same as those of live shows, until the collapse of the networks.

Few stations could afford the large staff that would be required to produce 18 hours a day of live programing, or even to go out and record enough concerts and other events to fill a daily broadcast schedule. So as the networks declined, station owners faced the same problem owners of non-network-TV stations face today: how to acquire cheap programing. (Perhaps the idea of recycling old network programs didn't occur to anyone in radio in the '50s.) Once it was demonstrated that a radio station could survive and even prosper just playing records, though, lots of new stations appeared on the dial. If a radio station could be operated with just a small and inexpensive staff (an engineer to run the transmitter, a couple of DJs equipped with one mike and two turntables, and an ad salesman to sell commercial time to businesses), then getting into broadcasting was an easy route to a lucrative income. Of course it didn't quite work out that way; so many new radio stations were started during the '50s, both on AM and on the newly assigned FM channels, that they divided the economic pie into too many pieces; there simply weren't enough businesses willing to buy commercial time to support all of those stations, and some of them inevitably attracted audiences too small to be worth advertising to. Radio turned out not to be the easy route to riches that some entrepreneurs hoped, but the hopes created the historical process that made radio what we know it as today.

Since the mid-'50s, most radio stations, on both AM and FM, have been operated in accordance with a standard formula: most airtime is devoted to playing records, and the records are selected to fit a narrow musical spectrum (*i.e.*, one station will play exclusively Top 40, another C&W, another R&B, another strictly classical, another "easy-listening"). A station's entertainment value derives, basically, from the content of the records, augmented by the personality of its DJs. The typical station offers the least possible variety, a smattering of news, no documentaries or background commentaries to put the news into perspective, no interviews, a minimal amount of public-affairs programing. Some of the more successful and profitable broadcasters go beyond this basic formula, but most do not. A quarter-century after the demise of the national radio networks, playing records continues to be the cheapest and most effective way for a radio station to fill airtime and attract audiences for advertisers. Other formats — detailed interviews, panel discussions, comedy shows, live concert broadcasts, investigative reporting — require greater manpower and therefore larger budgets than local stations are prepared to invest. Two other formats, live sports broadcasts and call-in shows, have proven to be profitable so long as only a few stations do them (and thus don't dilute the audiences for them).

Varied and creative programing is often found at non-commercial FM stations (those below 92 on the dial), typically made possible by low-paid or unpaid student labor at college stations. Even at non-student stations, volunteer labor is largely responsible for diversity in programing. For example, WBUR is one of the largest and most successful non-commercial stations, with numerous awards to its credit for innovative radio programing. But as with commercial stations, the major part of its broadcast schedule is used to play records (of classical music and jazz). They are played with unusually high technical standards, and are programed by some of the most knowledgeable and engaging producer/announcers to be found anywhere in radio today; nonetheless, over the years, most of the rest of WBUR's schedule, most of its innovative programing ideas, award-winners, and variety (such as programs by or for feminists, gays, and prison inmates, and consumer-advice shows about hi-fi, automobile repairs, and the law) have depended largely on volunteer labor. If everyone involved were paid professional salaries, these programs would become too costly for a single station to produce, and they might not exist.

The economic argument seems clear. By joining together to form networks, radio stations can share the costs of varied and adventurous programing, and can multiply the audience for those good programs that are produced. Ever since the collapse of the major radio networks in the mid-'50s, programers who believe in the value of good radio have been trying to form other networks, large and small, to create the conditions under which specialized programs can be produced. And a substantial part of the variety that does exist in radio today is traceable to these (sometimes tenuous) interconnections. For example:

All-news radio. WEEI-AM and a handful of other stations around the country don't play records. Instead, they fill 24 hours a day with a mix of news, commentaries, and service features on subjects like health, child-raising, movies, and the law. The heart of this operation is the remnants of the CBS radio network, much smaller than it was in 1945 but continuing as a lean, efficient business. In addition to feeding CBS news and features to member stations, it also accepts feeds from WEEI or other individual producers for redistribution to the other stations in the group.

The Boston Symphony. In Europe, where most radio stations are government-operated and tax-supported, concert broadcasts are a major activity and much less airtime is used for playing records. But in this country, live concert broadcasts (of *any* kind of music) are a rarity; for many years, the BSO was the only major symphony orchestra in the US whose concerts were broadcast regularly, relayed directly from the concert hall to transmitter. The broadcasts are produced and announced by WGBH personnel (can anyone imagine a BSO broadcast without the patrician voice of

Continued on page 16

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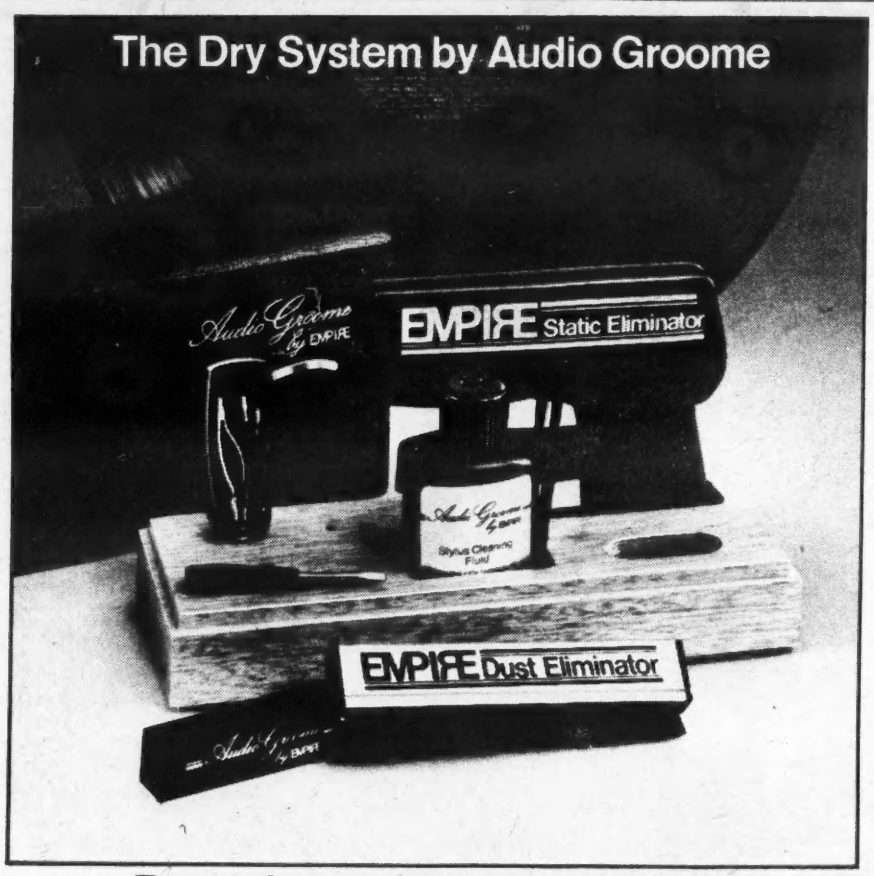

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Satellite

Continued from page 14

William Pierce?), using equipment installed in Symphony Hall for the BSO Transcription Trust. The Trust in turn is an organization staffed by engineers from WCRB who also record the broadcasts and prepare tapes that are mailed out to more than 100 other stations around the country, who pay for these copies and the right to play them on the air. Thus you can hear the Pops and the BSO around the country, and without this extra income it is unlikely that the local BSO broadcasts on WGBH and WCRB would exist. Similar concert-tape syndication arrangements have been established by other orchestras; in the Boston area we can now hear "live-on-tape" concerts by the New York, Cleveland, Chicago, and Los Angeles symphonies, the San Francisco Opera, and an increasing variety of jazz, folk, and other concerts.

Morning Pro Musica. WGBH's morning classical-music show plays a lot of records, but it also includes frequent interviews with musicians and live in-studio performances. It is heard not only around Boston but all over New England, from Maine to New York, through a mini-network of non-commercial FM stations.

Pacifica. Like much else that was popular then, it has faded from view, yet during the late '60s and early '70s a small but active network of FM stations produced and distributed a great deal of programing featuring anti-war activities, folk concerts, poetry, interviews, and lectures of a consciousness-raising nature. The Pacifica network included WBUR in Boston, WBAI in New York, KPFA in Berkeley, KPFK in Los Angeles, and KPFT in Houston (which was bombed twice because of its radical views). These stations and others still join occasionally to form one-day networks in order to broadcast such special events as the anti-nuclear rally in Washington last year.

Metropolitan Opera. For decades there has been a special network of stations across the country, a network that is formed each Saturday afternoon and dissolves each Saturday evening for another week: the Texaco network, created solely to broadcast "live" the matinee performances of the Met in New York. A few stations, such as WCRB, carry the program in FM stereo, but in much of the country the opera is heard on AM radios, complete with static and rolled-off highs.

National Public Radio. Formed 10 years ago, NPR is a network of more than 200 non-commercial radio stations around the country, most of them FM. NPR is to radio what PBS is to television, except that PBS's budget is vastly larger, of course. NPR's headquarters are in Washington, DC, and its best-known activity is the production and distribution of news and public-affairs programs: *All Things Considered*, a daily 90-minute news-and-interviews feature at 5 p.m. that has been called the best news program in the country; full-length broadcasts of congressional hearings, including those of the Watergate Committee, testimony on the Panama Canal and proposals to ban saccharin, and the SALT II hearings; and assorted interviews and press conferences. NPR also distributes (mainly by means of tapes sent through the mail to local stations) a startlingly broad range of music, especially of the live-concert-on-tape variety — not just classical, but also diverse jazz and folk and ethnic music, recorded not only in the big cultural centers but at local music festivals all over the country. There are also regular schedules of children's stories, poetry readings, drama productions — NPR's mission is to reflect both the political and the cultural life in this country in a way that makes efficient use of radio's potential, without the restrictions imposed by television's costs and requirement for mass audiences.

* * *

If networks and cooperative program-exchange groups are such a good thing, why aren't they more common? The fundamental problem is technical. Back in the 1930s and '40s, when network radio was in its heyday, nearly all transmitters and receivers were AM. FM was still an experimental medium. AM sound was monophonic, was subjected to many sources of noise and interference, and typically (though not invariably) was limited to a frequency range of a few thousand Hertz, well below the upper limit of human hearing. Listeners didn't expect to hear the full dynamic range of music, nor the full tonal range from the deepest organ-pedal bass to the highest overtones of cymbals and bells. In fact, the public was not accustomed to hearing high-fidelity reproduction of music in *any* public medium — not in AM radio, not in the optical soundtracks of the movies of the day, and certainly not in records (78 rpm shellac discs with a four-minute running time). Our conventional expectations have evolved a great deal since then, thanks to the development of full-frequency-range recording (late in World War II), the introduction of the vinyl microgroove record (in 1948), the widespread adoption of FM broadcasting (during the '50s and '60s), the standardization of stereo in records (1957) and FM (1951), and the development of Dolby and dbx noise-reduction circuits (in the late '60s). Music plays a large role in radio programing, so any network connection intended for widespread acceptance in radio broadcasting today must have technical standards consistent with what we are accustomed to hearing — *i.e.*, a network connection should transmit a frequency range comparable to the hearing range of the average listener (15 kHz), should accommodate a dynamic range of 60 dB or better so that interference and background noises won't intrude on the musical sound, and should be capable of carrying a stereo signal.

But the network connections that have been available to radio stations since the 1930s cannot do any of those things. To see why, we must imagine what a radio network consists of. If you want to set up a method of relaying the content of a radio broadcast all around the country, how can you do it? Well, we have the technology to transmit radio signals over distances of 60 to 80 miles and receive them with essentially perfect fidelity, with negligible added noise or distortion. So to relay a broadcast from Boston to New York (a BSO concert broadcast, for example), we could imagine transmitting it in Boston, having a receiver in Worcester receive and re-transmit the signal, another in Hartford likewise, and another in Bridgeport or Stamford to relay it over the final leg to New York City, where the local station would pick it up and re-transmit it to an audience there. Of course, if we want people in Bangor, Maine, to hear the concert, we need another string of relay stations to the north, and other strings of relays to carry the signal to local stations in Ames, Iowa, and Austin, Texas, and Fort Myers, Florida, and so forth.

Such a system of high-quality relay stations does exist, capable of carrying wide-band signals to every inhabited area of the US. But it can't be used as a radio network, because it is too expensive. The construction and mainten-

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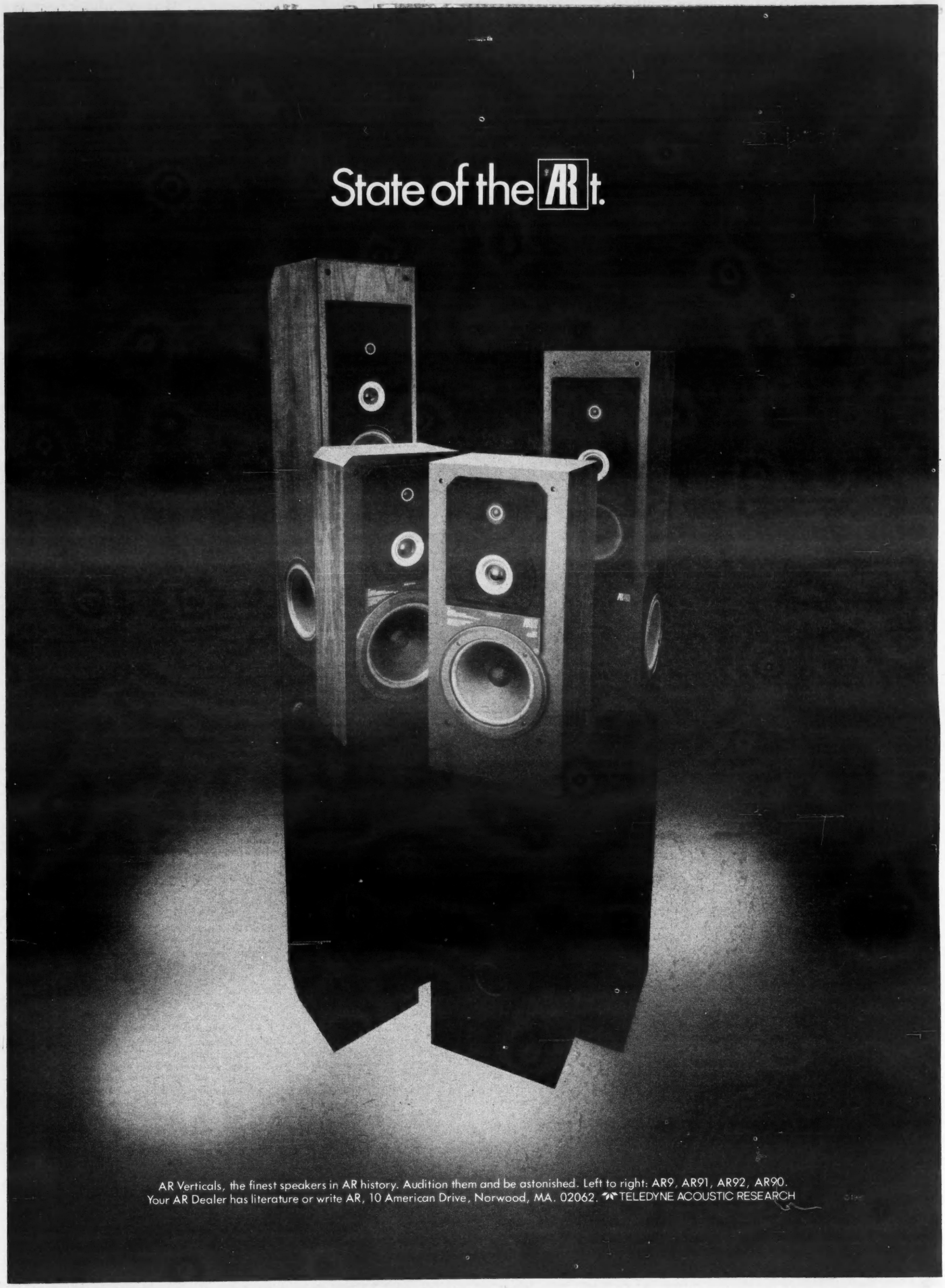

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Satellite

Continued from page 16

ance of this system of relay towers cost its owner (AT&T) millions of dollars; in order to recoup this investment it is necessary to charge users of the system a fee of many thousands of dollars per hour. These days, few radio programs can command an audience large enough to justify such an expense. Certainly a weekly BSO broadcast concert, even if relayed live in stereo by 100 FM stations around the country, would not have a total audience large enough to justify the interconnection expense (not to mention the repetition of that expense every Saturday night throughout the concert season). The cost of using this interconnection system is justifiable only for broadcasts that reach a true mass audience, an audience of millions. By now, of course, it must be obvious which are the few organizations whose daily budgets are large enough to accommodate the expense of using this nation-spanning network, the customers for whom this interconnection system was constructed during the 1950s: the television networks, with their production budgets of up to a million dollars per hour and their audience of 30 million per program.

So radio broadcasts are not (and never were) relayed around the country by a network of broadcast towers. It costs too much now, and the relay towers didn't even exist back in the days when network radio was popular. How else, then? There is one other network that connects every town with every other town in the country and can carry sounds from here to there: telephone lines. That's right, radio programs get from here to there over Ma Bell's phone lines, and that's the way it has been for 50 years or more. Whether the calendar says 1939 or 1979, the sound of CBS Radio gets from Washington and New York to Boston over a phone line; only for the last, local part of its travel is the signal transmitted through the air into your house or to your car radio. And until last year the same was true of the soundtrack of CBS television and the other TV networks: the picture was sent around the country by microwave-relay towers, but the sound came through the phone system.

At first glance this seems a bit odd. Everyone knows what telephone speech sounds like: tinny and gritty and somewhat distorted. But Walter Cronkite doesn't sound as though he is speaking by telephone, either on CBS News Radio or on TV; neither does Johnny Carson or Cheryl Ladd. The poor quality of telephone speech is not due to the telephone line from here to there; it comes from the lousy carbon microphone in the handset of your telephone and its mediocre little loudspeaker. If you use a high-quality microphone, and connect it to the phone line through a preamp and transformer the way a radio station does, a reasonably natural representation of your voice can emerge at the other end of the phone line (particularly if the phone line is connected to a decent amplifier and loudspeaker).

So when the right equipment is used at each end of the line, a telephone connection is capable of remarkably good reproduction of the speaking voice, even across the country. The telephone system provided the national hookups for network radio back in the days when radio was the nation's primary news-and-entertainment medium. Given the limited fidelity of AM radios and the quality of sound reproduction that people were accustomed to hearing from records and films, the phone lines were adequate to the task of disseminating Crosby's crooning, Jack Benny's jokes, and the Shadow's adventures.

And they remain adequate today for those network broadcasts that include only the spoken voice. News, presidential speeches, interviews, poetry readings, and the CBS Radio *Mystery Theater* are relayed around the nation today over phone lines. But as noted earlier, our standards for the reproduction of music have evolved a great deal during the past 40 years, while the transmission standards for phone lines have remained what they were — suitable for the speaking voice. Today, as noted, we expect music to be reproduced with a bandwidth of 15 kHz, a signal/noise ratio of 60 dB, and in stereo. A standard phone line has a bandwidth of 5 kHz, a signal/noise ratio of 45 dB or less, and is mono. And that, in a nutshell, is why general-purpose radio networks cannot exist today.

In theory, it is possible to overcome these limitations and send a stereo music signal from New York to Boston with reasonable fidelity: for a substantial extra fee over the regular rental for the use of the long-distance phone lines, Ma Bell will install equalizers every few miles along the line to compensate for the high-frequency rolloff of the cable, and she will try to select quiet amplifiers to boost the fading signal strength every few miles while preserving as much signal/noise ratio as possible. You could install Dolby or dbx noise-reduction units at the sending and receiving ends to suppress noise picked up along the way, and you could try to rent two matched equalized phone lines in order to carry stereo. But this effort is costly, troublesome, and has proved unreliable. As a practical matter, any radio network using phone lines is limited to AM-quality mono sound. So for years, radio engineers have been frustrated by their inability to disseminate high-quality stereo sound around the country. The only available technique was, and is, to run off lots of stereo tapes of each program and mail them to other stations. In addition to being a slow process, this also yields sonically degraded results, thanks to the high-speed tape copiers widely used to minimize the costs of time and manpower involved in making dozens of copies.

* * *

But radio-network heaven is on our southern horizon — out where WBUR's antenna is focused, in orbit. It's called the Westar I satellite, owned by Western Union. Westar is equipped with systems to receive and re-transmit to Earth several dozen channels simultaneously, and four of these channels have been leased by the Corporation for Public Broadcasting for use by National Public Radio. Each channel has a full 15 kHz bandwidth and is capable of a signal-noise ratio of well over 60 dB, so NPR will have the ability to disseminate to its member stations either four simultaneous full-fidelity mono programs or two full-fidelity stereo signals or (though it is unlikely) a high-quality quadraphonic broadcast, all at a cost barely greater than the present fee for renting low-fi mono phone lines covering the country.

Of course, a true cost estimate must also include the start-up costs for establishing communication with the satellite. This communication is in two parts, transmission (uplink) and reception (downlink). In addition to a central NPR transmitter sending programs to the satellite from a location near Washington, there will also be 15 other transmitting stations scattered around the country that can send programs up to the satellite, where they will be relayed directly to every NPR station equipped for satellite reception. In the Boston area, there's a transmission uplink at WGBH; once a signal reaches WGBH (from Symphony Hall, for example, or from another area NPR station wishing to distribute its programs to the network), it goes directly up to the satellite and is relayed to all receiving stations.

The other half of the process is the receiving equipment. Each NPR station is installing a satellite-receiving station consisting of a 15-foot parabolic-dish antenna aimed at the point above the southern horizon where Westar I hangs suspended in the sky, a high-gain amplifier to boost the weak signals received, cables to feed the signals from the receiving station into the studios, and a selector switch to pick off the programs desired from among the four available channels. There are two NPR network stations in the Boston area, WGBH and WBUR, and both will use the satellite system regularly.

This may sound speculative or futuristic, but it's not; it's happening now. WGBH is just putting the finishing touches on its ground-to-satellite "uplink" transmitter, and will be constructing its "downlink" station during the spring. WBUR started construction of its receiving antenna last fall, began experimental reception of one channel during December, and celebrated its 30th year of broadcasting by dedicating its satellite receiving station — with four channels operational — in January. Visitors to WBUR can see the receiving electronics mounted in an equipment rack in the rear hallway just outside of Studio A, with four amplifying channels and a monitor speaker for listening directly to the satellite signals.

According to Jim Bonney, who

Continued on page 20

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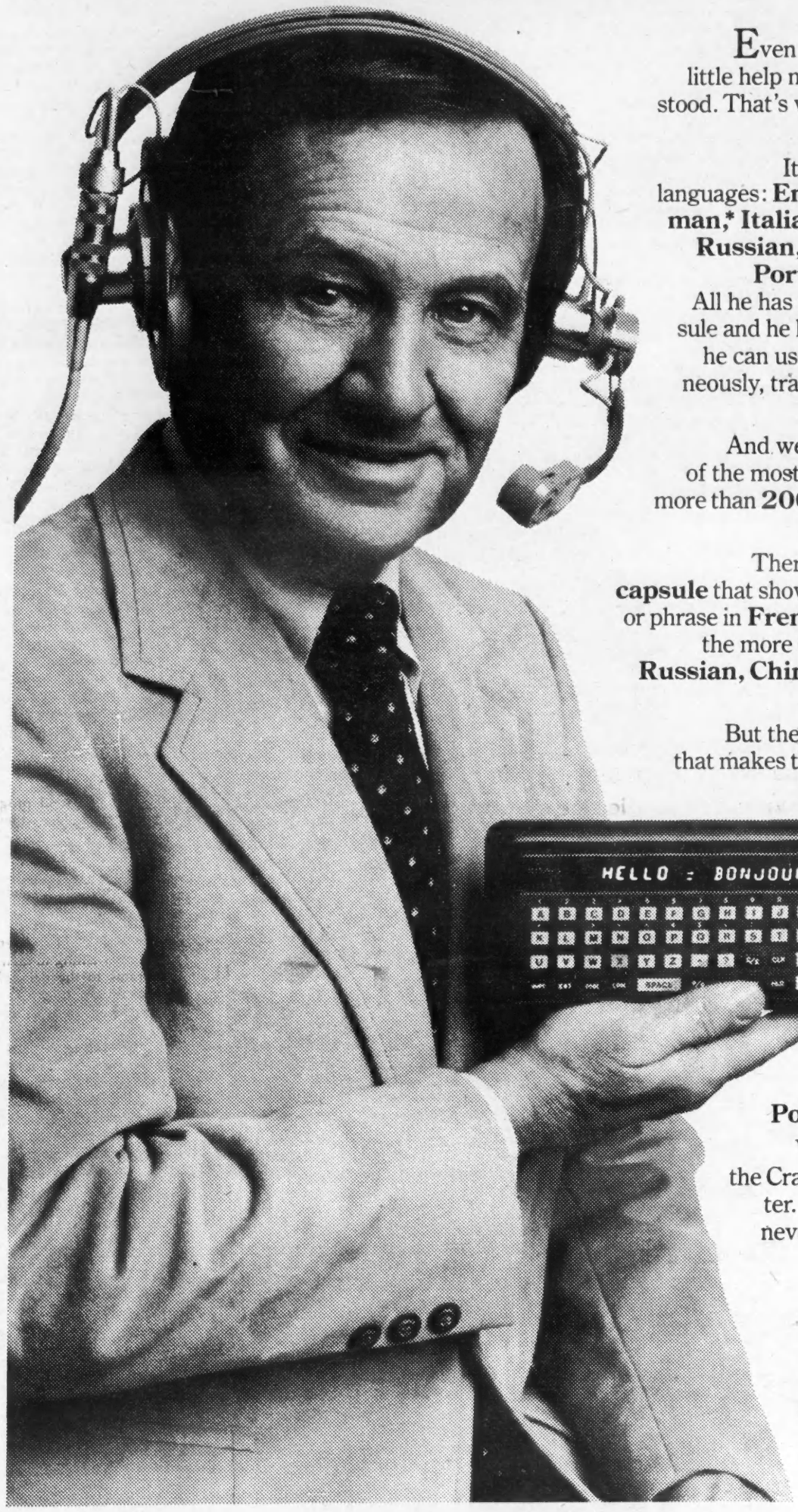

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Satellite

Continued from page 18

has been WBUR's chief engineer throughout its 30-year history, some NPR network programs will be relayed live to listeners over the air from the satellite. But to take full advantage of the diversity of programing available from the network, the station is procuring high-quality Studer tape recorders, which will be used with dbx noise-reduction systems, to record the satellite signals with the least possible loss of audio quality for later airing. As in the past, the two local NPR affiliates will cooperate when planning the programing to minimize duplications.

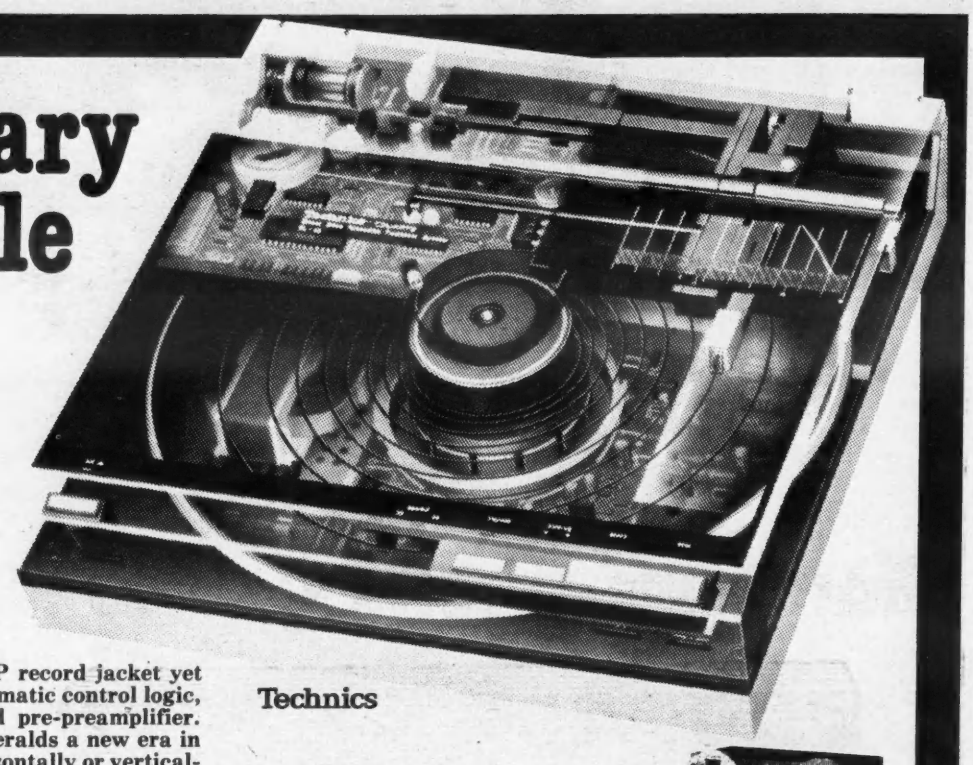
The cost of this venture is not small. The estimated bill for purchasing and installing the transmitting stations and a couple of hundred receiving stations around the country is about $18 million. Most of it is being paid for by the CPB, meaning that it comes out of federal taxes (at the rate of about 20 cents per tax-paying household). And part of the cost of installing each receiving station is borne by the individual radio station.

The anticipated benefits of NPR's satellite service are dramatic, particularly for audiophiles. Last year, listeners sitting in their homes in England and France were able to hear, in startlingly wide-range stereo, a live concert broadcast direct from Peking *via* satellite. American listeners were denied this experience, not because the satellite relay from Peking couldn't be picked up in the US, but because there was no readily available means of distributing a stereo broadcast to stations around the country. (Until now, the only regular distribution of live stereo broadcasts around the US has been the occasional piggybacking of audio on the video relay of special TV music programs such as *Live from Lincoln Center*.) With the NPR satellite system in place, full-fidelity stereo broadcasts of concerts of all types of music are expected to become routinely available. We will hear the concerts of the LA Philharmonic with as much fidelity as the originating station (KUSC) can bring to the task. A splendid roster of San Francisco Opera productions, chamber and solo recitals by artists such as Lazar Berman, *Folk Festival USA*, *Jazz Alive* with Bill Taylor, and a full plate of other musical treats is in order. For several years one of the most popular programs on WGBH was *Adventures in Sound*, a showcase for hi-fi sound featuring master tapes from major record manufacturers, produced by Victor Campos; Campos is now in Washington, but if the sound quality of the satellite relay fulfills expectations, he could revive *Adventures in Sound* with a national audience.

While music is the principal beneficiary of a full-fidelity national stereo-broadcast service, it is not the only one. Dramatic productions, for instance, can be startlingly enhanced by imaginative use of stereo sound and even more by the you-are-there realism of binaural sound reproduced through stereo headphones. Believe it or not, one major feature on NPR's schedule for 1980 is a 13-week adventure serial of *Star Wars*, produced with the aid of the BBC and featuring members of the cast of the original film. If you doubt that science fiction can be effective on radio without spectacular visual special effects, you don't know what earlier radio producers — and the terrified audience of "War of the Worlds" — knew about the power of the imagination when it's skillfully stimulated with sonic cues.

Since NPR's satellite broadcasts will originate from stations all around the country, a rich diversity of program content is sure to be available for local NPR receiving stations to choose from; and, of course, some of the satellite programs will originate here in Boston and be distributed to a national audience. Moreover, the array of choices is expected to broaden further. For example, WFMT in Chicago is one of the nation's best FM stations, and soon its entire program schedule will be available to a national audience, relayed by the RCA Satcom communications satellite. Unlike NPR, whose signals will be broadcast by local FM stations, the WFMT signal will be relayed to satellite-receiving stations and then distributed to homes by cable — the same cable systems now used for TV, equally usable for bringing stereo-FM signals to your tuner. If successful, this idea will surely spread. Network radio is back. ●

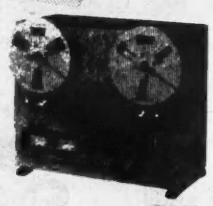
A Revolutionary New Turntable System...



Introducing the Technics SL-10. Ten years ago, Technics introduced the world's first direct-drive turntable and radically improved turntable performance. The Technics SL-10 is another quantum leap in turntable performance and operating convenience. This quartz-phase-locked control, direct drive turntable with linear tracking gimballed tonearm is the turntable of the future . . . but it's available today!

SL-10's width and depth measure the same as an LP record jacket yet house an amazingly precise drive system, extensive automatic control logic, moving coil cartridge with Boron pipe cantilever and pre-preamplifier. Since nearly every operation is automated, the SL-10 heralds a new era in record playing convenience. The turntable will play horizontally or vertically without any sacrifice in tracking accuracy while its DC power terminal allows you to play the SL-10 in your car or boat as well as at home. We invite you to see and hear the amazing new Technics SL-10, this week, at K&L Sound's Watertown location.

Technics



TEAC tape decks

CX-271 dolby cassette deck w/fluorescent meters $149
X-10 reel to reel, 10½" solenoid/logic transport $729
PC-10 portable stereo cassette deck (Wat) (demo) . . $299

Specials!

SONY cassette tape

EHF-C90 (chrome bias & E.Q.) three for $7.49

Buy three Sony Ferrichrome C-90 cassettes for $11.99 and we'll give you a fourth cassette and a carousel tape rack (holds 20 tapes) **FREE!**

PIONEER

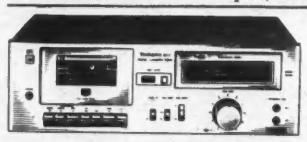
car stereo

KP-500 U/D FM cassette supertuner $129
KP-1500 I/D AM/FM cassette (fits most foreign cars) $89
KP-3500 I/D AM/FM cassette . $139
KP-8000 I/D AM/FM supertuner cassette . . . . . .
KP-8500 I/D pushbutton AM/FM supertuner cassette w/dolby . . $149
AD-320 power booster $49

JENSEN 30 3 way speakers

10" woofers, 3½" midranges, 2" tweeters.

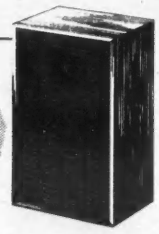
$149 pr.



Technics cassette decks

RSM-18 dolby cassette deck regularly $212.50 . . . . . $169
RSM-22 dolby deluxe cassette deck regularly $255 . . . . . $199

$299



AKAI BSR *Acousti-phase*

AKAI AA-1115: 15 watt per channel receiver loaded with features.
ACOUSTIPHASE microphase: high efficiency two way speaker systems with 1" dome tweeters.
BSR Quanta 400: belt drive, semi-automatic turntable with ADC magnetic cartridge.

Garrard

GT-35AP turntable
belt drive, automatic with Shure M91ED magnetic cartridge

just **$139.**

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At first glance different brands of tape look pretty much alike. But if you look closely, you'll find there are many subtle differences. At TDK we're committed to constantly improving out products. For years, our SA cassette has been the High bias reference standard for almost all quality cassette deck manufacturers. Yet we've incorporated improvement after improvement into SA's tape and mechanism since its introduction as the first non-chrome High bias cassette in 1975. These advantages mean better quality sound for you.

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864-1155 **Harvard Sq.**
16 Eliot St.
(across from Brattle Station)
653-2195, in **Natick**
Boston dial EAR-DRUM
1262 Worcester Rd. (Rt. 9, east bound, near IHOP)

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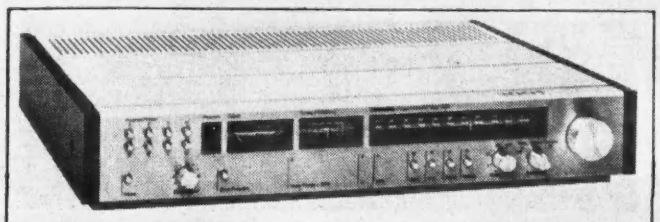
New Products

New magnets for JBL speakers

James B. Lansing, one of the largest American manufacturers of speakers for both professionals and consumers, has incorporated new magnet structures into the eight models in its Standard Line.

The new magnets, dubbed SFG, are made with an aluminum flux-stabilizing ring, which, it is claimed, produce the lowest level of second-harmonic distortion available.

The improved speakers, which include the L19, L40, L50, and L110 bookshelf systems and the L150, L220, L300, and L212 floor-standing models, also boast increased power-handling ability.



Tandberg separates

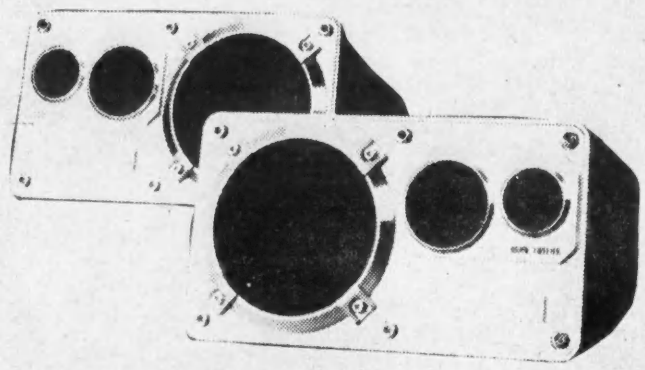
The 3000 series from Tandberg, the Norwegian company best-known for its tape recorders and slightly less so for its receivers, represents that company's entry into the field of high-end individual components.

The TPT-3001 programmable FM tuner claims a 90 dB signal-to-noise ratio and up to 125 dB of selectivity, using two-step ceramic filtering. The tuner has an electronic memory for storing eight selected FM channels. The dial position of the selected station shows up on a meter that doubles as a center-channel indicator when the tuner is not being used in the memory mode. There is also a dual-range signal-strength meter, calibrated in microvolts.

The TCA-3002 control amplifier contains a complete pre-preamplifier circuit for moving-coil cartridges, as well as adjustable resistance and capacitance controls for matching all types of conventional magnetic cartridges. There are monitoring and copying facilities for two tape decks, an infrasonic filter, and a separate headphone amplifier with its own volume control.

Power is provided by the TPA-3003, which delivers 150 watts of "high-speed" power to each channel with less than 0.02 percent THD. It is capable of operating into a wide variety of loads, and uses the entire chassis as a heat sink.

Prices are: $1500 for the TPT-3001 tuner, $1000 for the TCA-3002 preamplifier, and $1200 for the TPA-3003 amp.



Kenwood car speakers

Kenwood has now entered the car-sound business with the introduction of their model KSC-701 surface-mount three-way speaker system. The units are housed in a die-cast aluminum enclosure with slanted internal structure and rigid aluminum baffle, with an eye toward durability in hostile car environments. Claimed frequency response is 60 to 21,000 Hz, impedance is rated at 8 ohms, and the systems can handle up to 60 watts. The KSC-701s come with four-inch woofers, two-inch midrange drivers, and horn-type tweeters. Suggested price is around $230.

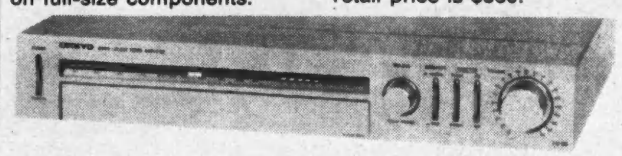
Plain and fancy ADC equalizers

ADC has three models in its Sound Shaper series, all of which can be used either to adjust a stereo system to a particular room's acoustics or to make up for deficiencies in recorded or broadcast music. The Sound Shaper One has five frequency bands, spaced two octaves apart, for each channel, while the One Ten has 10 controls per channel, at intervals of an octave. The Sound Shaper Two MkII has 12 controls, spaced approximately five-sixths of an octave apart, and also features LED level meters and individual gain controls. All of the units have a tape-monitor circuit and all give control over the individual bands of plus or minus 12 dB. ADC also makes an inexpensive sound-level meter, the SLM-300, which comes with a test record to allow you to get optimum room "equalization" from the Sound Shapers.

Onkyo's mid-size

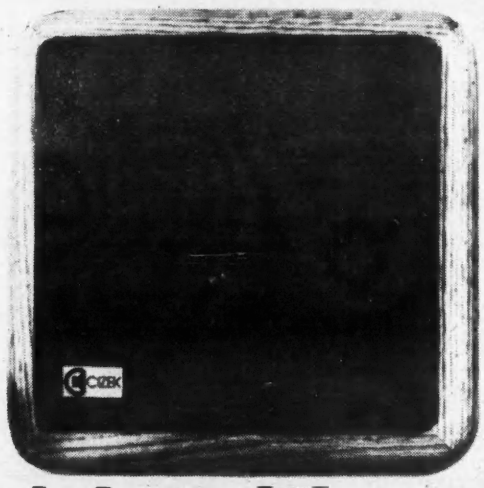
The TX-20 receiver from Onkyo weighs less than 16 pounds and stands less than three inches high, but it delivers 30 watts per channel minimum at less than 0.08 percent THD. It represents the company's solution to the high power *vs.* miniaturization conflict, and includes the servo-lock tuning system that has previously been available only on full-size components.

The unit has a disappearing front panel that hides the tone, balance, FM-muting, filter, and speaker-selector controls, and has lots of LEDs to let you know what mode you're in and how the FM signal is being received. The TX-20 also includes an automatic high-blend circuit that puts the high-frequency portion of weak FM signals into mono, minimizing noise. Suggested retail price is $330.



Infinity's Reference Studio Monitor

Infinity Systems has introduced a three-way, 12-inch bookshelf speaker they have dubbed the Reference Studio Monitor. The Speaker uses lightweight and extremely rigid polypropylene in its woofer and five-inch midrange cones, and includes an electromagnetic-induction tweeter, which, the company claims, gives response up to 32,000 Hz. The speaker weighs in at 50 pounds, and is capable of handling up to 250 watts. Suggested retail price is $300.



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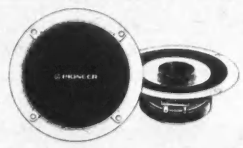
RADIOS — TAPE PLAYERS

MANUFACTURER	MODEL	DESCRIPTION	MANUFACTURER SUGG. LIST	AUTO SOUND PRICE
AUDIOVOX	UC-10	CASSETTE STEREO CARTRIDGE PLAYER	57.00	32.95
AUDIOVOX	ID-400C	AM/FM STEREO 8-TRACK IN-DASH	120.00	69.95
AUDIOVOX	ID-600C	AM/FM STEREO CASSETTE IN-DASH	120.00	69.95
BLAUPUNKT	ESSEN	AM/FM STEREO CASSETTE IN-DASH	250.60	227.80
BLAUPUNKT	CR-2000	IN-DASH AUTOREVERSE CASSETTE PLAYER AM/FM STEREO RADIO	275.10	249.95
BLAUPUNKT	CR-2001	IN-DASH AUTOREVERSE CASSETTE PLAYER W/PUSHBUTTON AM/FM STEREO RADIO & DOLBY	350.90	319.95
PIONEER	KP-8500	IN-DASH CASSETTE W/PUSHBUTTON AM/FM STEREO RADIO & DOLBY	249.95	199.95
PIONEER	KP-3500	IN-DASH CASSETTE WITH AM/FM STEREO	199.95	169.95
PIONEER	GX-4040	IN-DASH AM/FM STEREO PUSHBUTTON RADIO	119.95	103.95

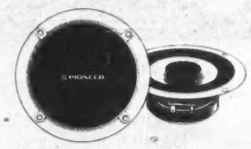
AMPLIFIERS — EQUALIZERS

MANUFACTURER	MODEL	DESCRIPTION	MFR. SUGG. LIST	AUTO. SOUND PRICE
AUDIOVOX	AMP-600B	60 WATT GRAPHIC EQUALIZER AMPLIFIER	100.00	63.95
PIONEER	AD-30	30 WATT GRAPHIC EQUALIZER AMPLIFIER	129.95	112.60

SPEAKERS



• TWEETERS
• MID-RANGE
• WOOFERS



AUDIOVOX	TRYVOX 25	6" ROUND 20 OZ. 3-WAY STEREO SPEAKER SYSTEM	60.00	37.95
AUDIOVOX	TRYVOX 20	6"x9" 20 OZ. 3-WAY STEREO SPEAKER SYSTEM	69.00	42.95
PIONEER	TS-100	4" SINGLE CONE STEREO SPEAKER SYSTEM	29.95	23.95
PIONEER	TS-168	6½" ROUND 3-WAY STEREO SPEAKER SYSTEM	124.95	99.95
PIONEER	TS-695	6"x9" 20 OZ. 3-WAY STEREO SPEAKER SYSTEM	139.95	111.95
KRIKET	8972	6"x9" 20 OZ. COAXIAL STEREO SPEAKER SYSTEM	84.95	49.95
KRIKET	8272	6¾" 20 OZ. COAXIAL STEREO SPEAKER SYSTEM	79.95	44.95

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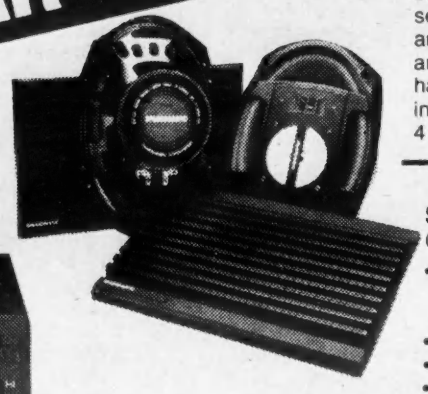
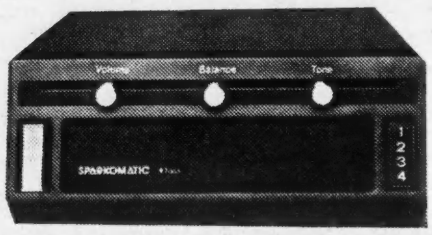
$15 IN CASSETTE TAPES FREE TO THE FIRST 25 PURCHASERS OF ANY CAR RADIOS!!



Designed for high fidelity reproduction across the full sound spectrum, these sets feature weather resistant speakers and ThermoTest™ grilles/housings. Sets are packed complete with stereo wire harness, hardware and installation instructions. All sets are compatible with 4 ohm tape players and radios.

SS 100
Under Dash 8 Track Car Stereo

- Slide Controls for Volume, Tone and Balance
- Program Selector
- Program Indicator Lights
- Audio Power: 4 Watts at 10% (RMS) THD. 3 Watts at 1% (RMS) THD



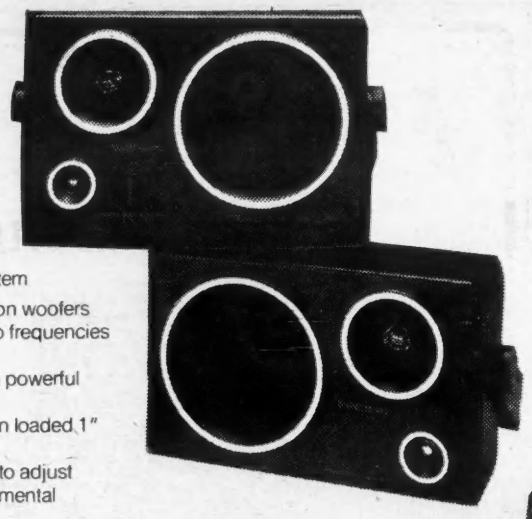
SS 200
Under Dash Cassette Car Stereo

- Left and Right Volume Slide Controls
- Hi/Lo Tone Switch
- Fast Forward/Eject Control
- Tape Play Indicator Light
- Auto Stop at End of Tape
- Audio Power: 4 Watts at 10% (RMS) THD. 3 Watts at 1% (RMS) THD

SK 6922T
6x9 Deck Mount Speaker Set

- 6" x 9" foam edge air suspension woofers with 20 oz. Barium Ferrite magnets
- Direct radiating 3" midrange speakers
- Dome-horn loaded 1½" tweeters
- High temperature 1¼" voice coils
- Handles full 40 watts of steady audio power with up to 80 watt peaks
- Perfect match-up with all amplifiers and equalizer/boosters

SK 620C

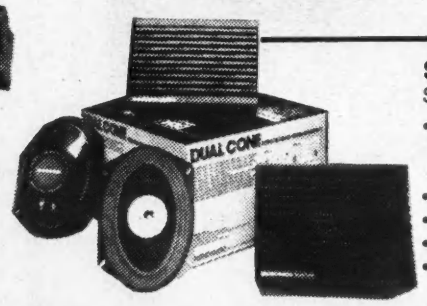


SK 525
Surface Mount Speaker System

- 4" foam edge air suspension woofers reproduce the lowest audio frequencies without distortion
- 2" midrange speakers with powerful ceramic magnets
- Wide dispersion dome-horn loaded 1" tweeters
- High Frequency Intensifier to adjust speaker to specific environmental conditions
- Rigid die-cast aluminum cabinet for vibration free performance
- Handles full 25 watts of steady audio power with up to 50 watt peaks
- Mounting versatility provides for surface installation in all size cars and RVs.

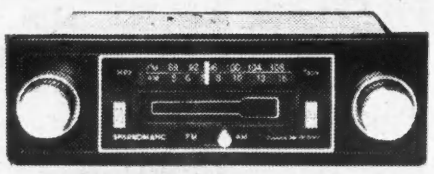
SK 620C
Door Mount Speaker Set

- 6" foam edge air suspension woofers with 20 oz. Barium Ferrite magnets
- Dome-horn loaded 2" tweeters
- High temperature 1" voice coils
- Handles full 25 watts of steady audio power with up to 50 watt peaks
- Perfect match-up with all amplifiers and equalizer/boosters
- Press-on ThermoTest™ grilles



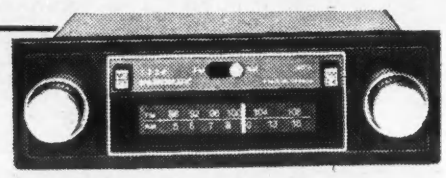
SK 510
Surface Mount Speaker Set

- 5" x 7" foam edge air suspension woofers with 10 oz. Barium Ferrite magnets
- High frequency whizzer cones
- Aluminum dome radiators
- High temperature ¾" voice coils
- Handles full 15 watts of steady audio power with up to 30 watt peaks
- Can be used with most amplifiers and equalizer/boosters
- Housings convert for door mount or deck mount installation



SR 300
Cassette AM/FM Stereo

- Rotary Controls for Volume, Tone, Balance and Tuning
- AM/FM Slide Selector
- Locking Fast Forward and Eject Switch
- Local/Distance Switch
- Stereo and Tape End Indicators
- Audio Power: 9 Watts at 10% (RMS) THD. 7.5 Watts at 1% (RMS) THD



SR 200
8 Track AM/FM Stereo

- Rotary Controls for Volume, Tone, Balance and Tuning
- AM/FM Slide Selector
- Illuminated Dial in Tape Door
- Mono/Stereo Selector
- Local/Distance Switch
- Stereo Indicator Light
- Program Selector and Indicator Lights
- Audio Power: 9 Watts at 10% (RMS) THD. 7.5 Watts at 1% (RMS) THD

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SOUND SH

THE FINAL COMPONENT

After you hear what an equalizer can do, you'll wonder how you ever heard music without it.

ADC has two new multi-band frequency equalizers. The Sound Shaper One Ten and the Sound Shaper 2 Mk II. Like the Sound Shaper One, each of these frequency equalizers helps to control acoustical imbalances.

How?

Well, based on the logarithmic or octaval nature of the musical spectrum, equalizers segment the audio frequency range and adjust the level of each segment to the desired tonal balance.

But an equalizer is not just a sophisticated tone control. Unlike a tone control, an equalizer can balance the mid-range frequencies, the usual area of difficulty.

Have you ever listened to an expensive audio system made up of superb individual components that together sound terrible? The problem may be a mismatch of cartridge to speaker, wrong speaker placement or the room itself may have severe acoustical imbalances. The solution is an ADC Sound Shaper.

Or have you ever played a record where the recording engineer mixed down an otherwise great album so that the vocals or instruments have been subdued to obscurity or simply drowned each other out? An ADC Sound Shaper is the solution to that, too.

Perhaps you're sorry about buying that high-powered amplifier instead of those enormous speakers with their wonderful bass. An ADC Sound Shaper can solve that problem for you.

Even if you're just tired of the rumble, hiss and surface noise of your records, an ADC Sound Shaper can help.

So you can see just how useful the equalizers can be.

Here are some unique applications of a frequency equalizer. Applications that can make any sound system sound better.

1. Make a good speaker a great speaker.

The potential of any speaker is almost never realized. By restricting the speaker to "flat" incoming signals, it can seldom reproduce the lowest or highest notes it's capable of. It can't even reproduce all the music in between with optimum balance.

Contrary to what some manufacturers try to tell you, there are some very basic laws of physics that govern how low the frequency response of a speaker is. They are: the mass of the moving system, the cone area, the magnet and voice coil strength of interaction, and the cabinet volume. Once these things are designed into a speaker, the low frequency response can't be lowered. Except by electrical equalization.

Sometimes speakers have a midbass hump. That gives you the illusion of listening to deep bass but actually, it's just plain boom. A multi-band frequency equalizer can extend the midbass hump and at the same time, unlike a normal tone control, extend the true low bass response.

Bass reinforcements from walls, floors and ceilings can have a 6dB or more variation in low frequency output. That can restrict you on where you can place your speakers. However, an equalizer can correct it without restricting you from putting the speakers wherever you want.

The only way to "shape" your music to your room and to the kind of music you like to listen to is with an equalizer.

2. Make your tastes prevail, not some engineer's.

The recording engineer has tremendous power. He mixes and balances the music based on his ears. So you're listening to his interpretation of the music, which may not be what you would prefer.

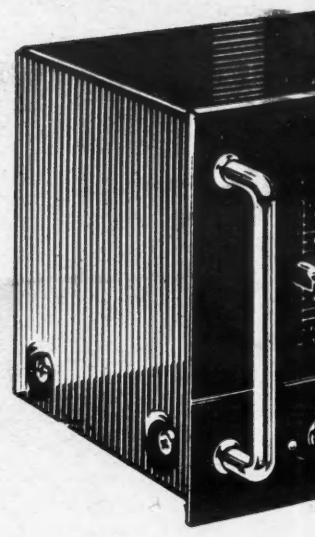
For instance, if you want to hear more of the vocalist, with an equalizer you can. Or, if you'd rather hear more guitar, you can adjust that too. So you're actually tailoring the music to fit your ears.

3. Get rid of rumble, hiss and surface noise.

To stop rumble or low frequency overload, adjust the lowest control on an equalizer. Since there's little of the fundamentals below 40Hz, you probably won't miss any music.

To stop scratches or other surface noise — or even tape hiss — just bring down the levels at 5 to 9kHz and above.

You can even use an equalizer to compensate for the boosted highs when you're listening to tapes recorded with a Dolby and you don't have a Dolby playback decoder.



4. Improve record, tape and broadcast quality.

Good quality radio broadcasts are rare. But audio equalization can properly rebalance the signal. Equalization can also rebalance records or tapes that seem to be lacking in tone and range.

5. Make studio quality tapes, without a studio.

To make any tape sound smooth and professional, you need a studio environment. But without one, you can still make your tapes sound professional by using a frequency equalizer.

6. Eliminate feedback and adjust the balance of live performance

An equalizer is a must for good live performing. A performer can increase the voice over the band, or increase the volume without feedback, and adjust the sound of the

HAPERS

THE ADC SOUND SHAPER ONE.

It operates in five frequency ranges. From 60Hz to 10,000Hz. Each range has a sliding control for each channel. The controls give ± 12dB to add or subtract from the music giving a total range of 24dB. They're marked in 2dB increments. The power and tape monitor switch are push-buttons that work instantly. All the audio connections are standard. Installation takes about three minutes. And two minutes later you can be listening to music the way you want. To fit your ears.

THE ADC SOUND SHAPER ONE TEN.

It operates in ten frequency ranges from 31Hz to 16,000Hz. Each range has separate linear (sliding) controls for each channel. The controls will give minimum 24dB ± 12dB to either add or subtract from the music. They're marked in 2dB increments. The Power, Line Record, Tape Monitor, and Eq-Bypass Controls are instantly working push-buttons. All audio connections are standard. No tools are necessary to install a Sound Shaper One Ten. And installation takes about three minutes. A few minutes later you'll know how much fun your music will be.

BSR

band to fit the room being performed in. All with a frequency equalizer.

7. **Stop transducer incompatibility.**

Sometimes a good cartridge and a good speaker system still result in a not very good sound. But the proper control on an equalizer can fix all that by taking the sound down a few dB.

8. **Revive 78's and other oldies but goodies.**

Recently, the record industry decided to set the present RIAA standard for phonograph equalization. So old recordings may sound awful on today's sound systems. They tend to sound like there are no true basses or highs, scratchy, and strident in the midrange.

An equalizer can fix all that. And if you want to permanently fix it, record the record using the equalized signal.

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A number of improvements

Digital circuitry and the car-stereo market

by N. I. Weinstock

We've all read about the computerized home of the future; the advent of so-called "home computers" gave that kind of talk a big push. But who really needs a computer to water the lawn? Much of computer technology applied to home stereo, too, is superfluous; do you really need your receiver to tune itself in one second when you can do as well in five? Must you take the cuts off a record in different order from the way they were laid down? I don't mean to say that all logic circuitry in home stereo is a luxury; it's just that in the end, only a very few of us will notice or care about the difference.

A car, however, is a small, closed environment with fairly easily defined purposes, and is already viewed by its owner as a machine. It therefore lends itself more readily to computerization. In the near future, many engineers expect totally computerized systems control to come out of Detroit. But in the meantime, the average human's first direct contact with the computer is likely to be in the car, in car stereo.

Logic, or "smart," circuits are now accomplishing functions that would not be neccessary in the home, functions demanded peculiarly by car stereo. Manufacturers seem almost afraid to advertise these things yet — they don't seem to have figured out how. But about a half-dozen have recently come out with radios and cassette players employing a lot of logic circuitry. Many are available now or will be in the next two months.

The simplest developments are auto-reverse and automatic head and drive-wheel disengagement when the ignition is turned off, in order to protect your tape, transport, and head assembly. These are all now offered by several manufacturers. Last fall, Clarion came out with what it calls signal-actuated stereo control, advertised as Magi-Tune (for any who don't want it explained). The feature automatically blends high-frequency stereo signals when reception weakens. It is available in units that list for about $200. This is the kind of adjustment toward mono that many people would not bother making for themselves (and proceed to let bad reception create a case of nerves) or would veer all over the road trying to accomplish (as I do).

In January, at the twice-yearly Consumer Electronics Show, more companies introduced even "smarter" radios, with convenience features that just might save a few lives. Sanyo showed the FT9, which automatically adjusts not only separation but also muting and tone-control (specifically treble-response) functions as a signal fades in and out. More than one case of drivers' nerves should be conquered by this. The smart radio takes over where the smart human quits in efforts to diddle with the reception; most people will soon take better sound — and computer logic — for granted.

Kenwood has just gotten into car stereo as a whole, and its new KR 311, 511, and 711 (priced from $269 to $449) feature, among other things, "cassette standby," wherein a cassette may be cued up indefinitely and programed to activate automatically when radio reception falls below acceptable limits. (This, of course, after your radio has already tried everything else.)

Blaupunkt's new Berlin 8000 (a total system, with four channels of 20 watts each in a separate power amp, offered with speakers for a mere $1300) will even increase or decrease volume automatically according to the differences in background noise as you open or close windows, turn on the heater or air conditioner, hit potholes, sing along, etc.

Motorola has a completely digitally tuned unit with 10-station memory, auto-scan and auto-search (which had always made a lot more sense in a car than at home, but are now available throughout the high-fidelity market). Other manufacturers, such as Sony, Mitsubishi, and Alpine, plan soon to bring out "smart" units of their own.

Will we soon see a logic race, instead of the silly power race that is now the fad in car stereo? It's to be hoped so, if only because a few more chips will not burn out your battery as a few more watts will. There is also every reason to suppose that as stereo components grow into logic components, we will eventually have outboard car-systems controls. (The Texas company that manufactures Cadillac's cruise control is now very quietly offering it for outboard sale, and small computer companies around the country have other monitoring gadgets in the wings.)

Does all this extra gadgetry produce any distortion and S/N problems? Well, in some cases, digital tuning and auto-search-and-scan actually cause a tad more distortion. This is usually not evident on the home front because of home stereo's much better distortion figures. And if you compare the digital search mechanism with what you would most likely have in your car otherwise — a flywheel and punch-button system — the digital tuning actually distorts less. Generally, however, distortion figures and S/N for the other units described here don't seem to be affected, if the claimed figures are accurate. The only units I have had a chance to audition are the Clarion (its figures are accurate) and the Berlin 8000 (which, as one would expect, is beyond reproach). In the Sanyo or Kenwood, when tone controls are activated, one would expect S/N to go down, but that's the price one pays, and it's not a high price if tone control is needed. Our final analysis, until we can get these units on the test bench, is that their noise is no worse than that of comparably priced car systems, which usually achieve abysmal to fair ratings.

(Which brings us to a sad development in car stereo that ought to be mentioned: just as the sound source is improving through digital logic, so the end of the playback system, unfortunately the most vital part — the humble loudspeaker — is taking a turn for the worse. Because people are squeezing their bigger audio systems into smaller cars, the standard 6x9-inch speakers often simply don't fit. Their accuracy often wasn't so wonderful to begin with, and now the smaller speakers — with lighter magnets, voice coils, etc. — are, for the time being, generally taking a turn for the worse in quality. Solution: either a bigger car to fit your stereo — how unpatriotic — or more ingenious installation techniques. Don't believe that the new smaller, thinner speakers are better than the big ones; it just isn't so.)

Oh yes, microprocessors. They're the heart of the new functions. They not only "run cool," but are getting more complex and cheaper all the time, despite their being petroleum-based. Which means that logical stereo, now priced just above the average, should soon be as ubiquitous as calculators. ●

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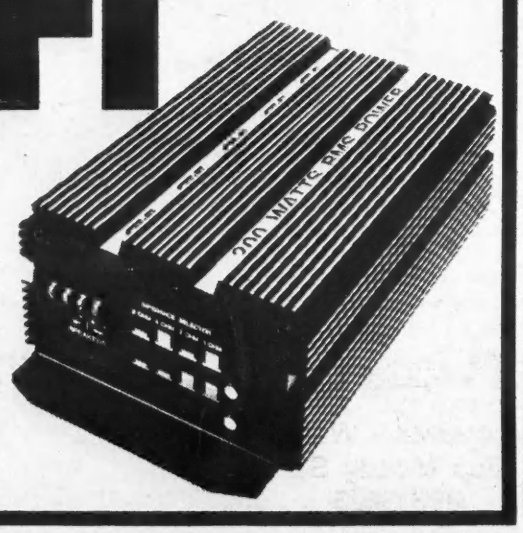

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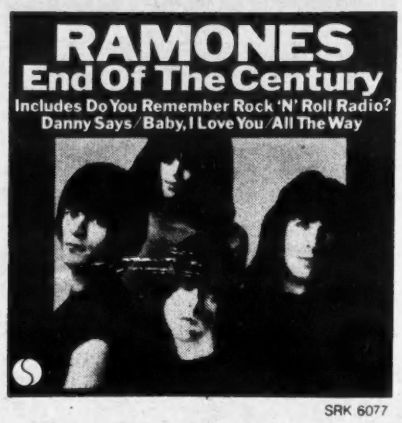

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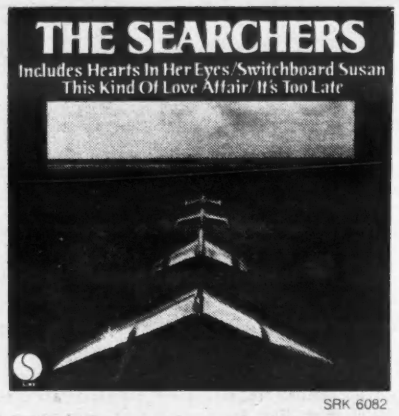

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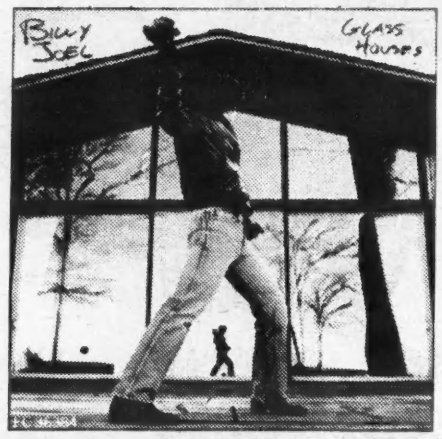

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The man who invented FM

The tragic life of Major Edwin Armstrong

by Gary Stock

Given the opportunity, Sophocles or Shakespeare would have made a superb drama of the story. Consider it: a young inventor, a man of patrician breeding and amazing creative gifts, develops the most important new idea of his time at the age of 22. Wealth, fame, and influence accrue to him as he grows older, and he develops other seminal inventions that influence every segment of his society. But as his ideas prove more and more valuable, he is harassed by powerful corporate interests, until finally, in the autumn of his life, worn down by endless legal struggle and acrimony, he takes his own life in a leap from a high place.

But no one has written a play about Edwin Howard Armstrong, who developed three inventions that changed our lives: the feedback circuit and the superheterodyne principle — which individually or in combination form the bases of almost all modern radio and radar communications — and FM radio itself, which first brought high-fidelity music to millions and spurred the development of home high-fidelity components. It has been said that Armstrong's contribution to technology was as great as Marconi's, or even Edison's. And in many ways, the story of his life is even more extraordinary, and more symbolic of the 20th-century morality, than either of theirs.

Born in 1890, Armstrong grew up in what was perhaps America's last period of real optimism and confidence. His family, like most prominent families of the time, was in the business of business. He was fascinated from an early age by electronics, specifically by what was then called "wireless" — dot-and-dash radiotelegraph communication. There was no such thing as voice transmission by radio, except in laboratory experiments; Armstrong would later make it possible.

In the best boy-inventor tradition, "Buzz," as his family called him, ate, slept, and breathed radio. He converted the attic of his parents' Yonkers home into a radio laboratory, and amassed the ponderous and primitive technology of the day — huge foil-lined glass jars, tubes of iron filings, outsized wire coils, and long antenna leads held aloft by huge kites. When he was 20, he built virtually single-handedly one of the tallest radio masts in the area — a 125-foot monster. Delegations of housewives came to his mother's door, demanding that Armstrong stop its construction; watching him hang upside-down to work brought on mass anxiety and fainting spells. His mother, apparently used to the idiosyncrasies of genius, told them, "If it makes you nervous, don't look."

The incredible antenna towers and kite antennas of that era were necessary simply because even the best radio receivers were so weak. Radio operators wore vise-like earphones and held their breath while listening for messages. Most long-distance communication was conducted at night, when the faint static generated by the sun was not present. Every foot of antenna height was valuable in collecting the electrical power required by early receivers. The speaker of a modern-day portable radio requires a watt or so from its amplifier, but primitive headphones had to get by on the few millionths of a watt pulled directly from the air, since amplifiers were all but unknown. This lack of receiving sensitivity was the major obstacle to progress in radio.

The Armstrong Foundation

Edwin Howard Armstrong in World War I

By the time he went off to Columbia University, in 1909, to earn his degree in electrical engineering, Armstrong knew more about the history of electronics and about esoteric points of theory than most of his professors. Beyond this, however, he had come, through thousands of practical experiments, to understand keenly the movement of electrons. In the same way that generations of teenage car buffs would detect faults by visualizing all the movements of an automobile engine, Armstrong could glance at a complex arrangement of electronic parts and know immediately how they would act.

It was this gift for comprehending circuits that brought Armstrong to the first of his major inventions, in 1912. Late that summer, just before returning to finish his senior year at Columbia, he was struck by an idea while on vacation with his family in the Vermont mountains. The idea, which is now used in virtually every radio, television, and radar in existence, was to send part of the tiny radio signal that arrived from the antenna in a loop, or "wing" as he called it in his notes, back to the beginning of the circuit after it had reached the end. This, when properly done, re-amplified the incoming radio signal again and again with each movement of electrons through the loop. For obvious reasons, he called the principle "regeneration," although the more literal term "feedback" is now more commonly used. The effect of this arrangement on his home-brew radio receiver was astounding. Radio stations in Ireland, Nova Scotia, and Europe, which had been lost in static, flowed from the headphones with complete clarity. Many American stations were suddenly so loud that he could no longer bear to wear headphones, and he listened to their signals with the headset lying on a table across the room. As an undergraduate in engineering, Armstrong had built the world's best radio and redefined the field's principles, all in his attic in Yonkers. He would also find in the next couple of years that feedback could be used to develop a new type of transmitter, one capable of bringing the spoken voice and music over the airwaves to millions.

Armstrong's father, a solid Republican sort, didn't see the potential of his son's experiments, however, and refused his son the $150 he needed for a patent application. After a hurried and unsuccessful canvass of friends as broke as himself, Armstrong settled for having his lab sketches notarized and dated. Finally, a few months after his graduation, he applied for a patent. It was issued in 1914, just after World War I began.

America was not to become directly involved in the war for another three years, and it was during this period that Armstrong's fame spread. His feedback circuit became the darling of the amateur-radio set, and rights to various parts of his patent were bought up by the American Marconi Company. But AT&T began to use the circuit for long-distance telephone communications without paying royalties to Armstrong, and in a court action backed an inventor who claimed to have invented essentially the same thing. It was to be the first of many legal battles for Armstrong.

In 1917, the entry of the US into the war took Armstrong from the world of patents and inventors' claims to France. Predictably, he became a member of the Signal Corps, and spent most of the war rebuilding the Allies' radio sets (without license, by the way) so they could use the feedback circuit. It was in Paris just before the end of the war that Armstrong, then 28, made his second great invention.

It was called the superheterodyne circuit. Unlike feedback, it is a development of such subtlety that it defies easy description in lay terms. Radio waves consist of electrical currents that vary rapidly; the number of variations per second is called the "frequency." An AM radio station's signal might consist of an electrical signal that varies at 550,000 times per second. An FM signal may have a frequency as high as 1.08 million cycles per second. These variations are unimaginably rapid to us; in 1917, radio engineers had learned how to build transmitters and receivers capable of working with frequencies of up to about one million cycles, but above that they ran into a stone wall. The superheterodyne circuit was an arrangement by which very-high-frequency radio signals could be transformed into more easily handled low-frequency signals. This was accomplished by mixing the incoming radio signal with a second signal generated inside the receiver that differed slightly in frequency. This mixing produced a signal that was precisely the arithmetic difference between the other two. In effect, it subtracted one radio wave from another, producing a third that could be easily processed and amplified. This development is found in one form or another in almost every broadcast-reception device available today.

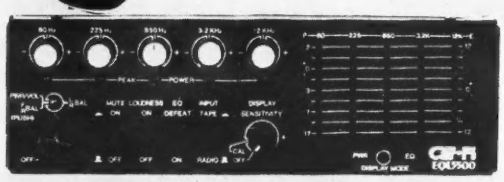
At the end of the war, Armstrong, who'd been decorated by the Allied governments for his assistance in improving field communications, returned to New York, carrying the superheterodyne circuit in his head. At that time, inventions developed by Army personnel could be retained and sold by the inventor. In short order, Armstrong did just that, selling both the commercial rights to feedback and the "superhet" patents to Westinghouse for a huge sum. He also defeated AT&T in his first court battle and sold a refinement of the feedback principle called "superregeneration" to the newly formed Radio Corporation of America for another six-figure sum plus 60,000 shares of RCA stock. Armstrong was all at once a wealthy man, young, full of new ideas, a celebrity in the roaring '20s, the dawn of radio's golden age. He had, by the time he was 30, accomplished the American dream in just about every particular.

He fell in love with a secretary to RCA's David Sarnoff, who was at that time Armstrong's friend. He approached her with the irresistible force of a successful entrepreneur accustomed to achieving his objectives. "How would you like to take a drive in a fast foreign car?" he asked her. "I'm leaving for France on a vacation tomorrow and I intend to buy the biggest and most expensive car I can find to bring back." He returned with one of the most exotic cars of the era, a fawn-colored Hispano-Suiza touring car, with which he courted Marion MacInnis through the spring and summer of 1923. They were married in the winter of that year, and they honeymooned in the style of the times, by driving the Hispano-Suiza to Florida. It was certainly one of the happiest years of Armstrong's life, and the last before the start of a long chain of legal struggles that brought him to suicide.

The AT&T-backed man Armstrong had beaten in court on his return from World War I was Lee De Forest, a man justly renowned for inventing the audion tube, an important building block in early electronics, but one also known during the course of his

Continued on page 30

CONTROL



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Armstrong

Continued from page 28

life for an unending series of unscrupulous efforts to take control of other persons' inventions and for the formation of dozens of short-lived companies. De Forest, backed again by AT&T and later by RCA, fought a shrewd battle throughout the '20s to overturn almost all of Armstrong's patents. Attacking again and again in different suits, he finally found a favorable court for one suit, won a decision, and parlayed that decision through shrewd manipulation of patent law into a stunning Supreme Court victory (decided on precedent, not on the facts) in 1934. It was one of the longest and most complex patent actions in American history, all the more extraordinary because virtually the entire scientific community as well as the lower courts rejected De Forest's contentions as clearly and obviously incorrect in the technical sense. When Armstrong, at a convention of the Institute of Radio Engineers, attempted to return the awards given him for his developments, a unanimous motion of the membership reaffirmed his rights to the awards and requested that he keep them. But in the legal sense, and in much of the popular press, Armstrong had become "the discredited inventor."

But Major Armstrong, as he was then called on account of his former Signal Corps rank, had one great idea left. Throughout the long legal fight, he had continued his laboratory work, searching, as were many engineers of the day, for a solution to the problem of static in radio reception. Static is the electrical byproduct of natural events, like lightning and sunspots, and all AM radio reception is to this day afflicted with it, since such natural events amplitude-modulate (AM) the airwaves just as a radio transmitter does. Any receiver designed to pick up conventional AM radio signals must also pick up random natural electrical events and translate them into static. After 10 years of work, Armstrong had concluded that there was no clever way around this. The only means to free radio reception of static was to change the way in which radio signals were broadcast and received so that natural events could not interfere with them. One way of doing this was to broadcast a signal whose *frequency* was constantly varied — hence FM (frequency-modulated) radio. Between 1930 and 1933, Armstrong, now savvier with respect to legal questions, filed a series of seemingly airtight patents. He thought his rights to FM broadcasting were now undeniable.

But for all his new-found legal cunning, Armstrong had not counted on the fundamental egocentricity of the American corporation. FM would require both new transmitters and new receivers; neither broadcasters nor the public would want to buy one unless the other already existed; it was a chicken-and-egg situation that could be resolved only by the formation of an FM network. Armstrong approached his old friend Sarnoff at RCA (the company still controls the NBC radio network) and proposed the new system. For two years, RCA conducted studies, asked for more information, and generally delayed decision on the issue. At one point, Armstrong approached Sarnoff for an explanation of the delay. "There is a depression on," noted Armstrong. "The radio industry needs something to put life in it. I think this is it." Sarnoff replied, "This is not an ordinary invention; this is a revolution." Sarnoff, the immensely successful businessman and corporate tactician, apparently realized that the higher fidelity of FM and the vast number of new stations it would make possible might lead to a complete — and for RCA, perhaps devastating — restructuring of the broadcasting business. Because of this, and because he was about to commission a wholesale corporate effort to develop television, he saw no benefit to RCA's developing FM radio rapidly.

Left with no other choice, Armstrong, now modestly wealthy but still a private individual, set out on his own to develop FM radio commercially. He constructed a 400-foot broadcasting tower, on the Palisades (it's still standing), and after licensing a handful of other experimental stations to broadcast in FM, took to the airwaves himself. The first broadcasts proved false the rumors planted by big business that FM wouldn't work. The quality of the reception on his experimental station was beyond anything that had ever been heard on AM radio. Technically, Armstrong's station, W2XMN, was wider-band, lower-noise, and lower-distortion than any AM station in history, and it was static-free. Some 40 other FM stations — most of them small, independent affairs, but a few owned by large companies like General Electric — quickly sprung up, despite maneuvering by the broadcast giants to have FM's broadcast band limited so that the number of FM stations capable of operating in any given area would be only five. Even RCA set up an FM station. It appeared that the new method of broadcasting was established.

World War II intervened, however, and brought to a halt all work on new broadcasting projects. Armstrong's income was greatly reduced, since he again gave the government his patents royalty-free, for military purposes. At the end of the war, Armstrong expected to pick up where he had left off and establish a commercially successful FM broadcasting industry. But in 1945 a series of FCC decisions (which were advocated by his old opponents, the major broadcasting networks) dealt Armstrong and FM two telling blows. One moved FM from its old band to the present 88-to-108 megahertz band, thus instantly rendering obsolete every FM transmitter and receiver in existence. The other decision (which was more transparently corporately motivated) reduced the maximum transmitter power of most FM stations to a single market area. Armstrong spent the next two years attempting to recover from these decisions and put FM back on the track.

The frustration of his unending battles with the major broadcasters and radio manufacturers finally brought Armstrong to file, in 1948, a huge lawsuit against RCA and its subsidiary NBC for patent infringement on his FM broadcasting system. Every television set manufactured by RCA (and, since that date, by anyone else) used FM for its sound channel; RCA had also been manufacturing FM radios and, incredibly, licensing FM rights for several years. Armstrong sought to recover damages on every set ever made by RCA and its licensees, and thereby to achieve some measure of reparation for the long battle he had been forced to fight. This suit was to be his last, however. RCA's attorneys, taking full advantage of patent law, kept him on the witness stand for a full year, going over every detail of his invention of FM. After the courts finally cut off this interrogation, Armstrong's attorneys spent an additional two years examining every RCA record pertaining to FM — a monumental quantity of paper. The company throughout this period held fast to its claim that Armstrong had only refined certain FM principles, and that most of the real work on bringing FM to commercial fruition had been done in RCA laboratories. On the witness stand, RCA chairman Sarnoff stated that RCA and NBC had done more to make FM a reality than anyone else, including Armstrong.

During this period, Armstrong devoted every waking hour to the trial, driving himself to exhaustion. Then he and his wife separated, she to live for a while in Connecticut with a sister. The combined strain of his professional and personal lives finally proved too much. On a Sunday night late in the winter of 1954, he stepped out of a window of his apartment, 13 stories above Manhattan.

Ironically, he, or rather his estate, would be victorious in each of the suits that had been filed against RCA and its licensees; most were settled by agreement. And the verdict of history, as represented by his being awarded the Edison Medal and the Franklin Medal and his inclusion among the 20 Great Men of the Union Internationale des Telecommunications, is clearly that he was the developer of all three devices and an inventor on the scale of Bell or Whitney.

Armstrong, it might reasonably be argued, was finally defeated by a new system of human relationships and morality dedicated to the advancement and benefit of collective groups whose only avowed purpose is profit. He was among the last of the great individual American inventors, a species endangered or perhaps extinct, now that vast corporations control virtually all scientific and technological development in this country. Perhaps this is not a coincidence. It is almost certainly not a coincidence that American institutions have, over the past few decades, lost the public's esteem even as they've achieved their greatest power. Armstrong's story would indeed make a superb play, all the more significant because the story is true, the meaning undeniable.

NOTE: Edwin Armstrong's full biography, from which this article is in part derived, is Man of High Fidelity, *by Lawrence Lessing (Bantam), and is available for $1.50 from the Armstrong Foundation, Columbia University, 510 Mudd Building, New York, NY 10022.*

A plug for 'Shop Talk'

One of the most popular programs on WBUR is an informal conversation about hi-fi equipment and recordings that is broadcast every Saturday morning from 10 to 11:30 a.m. Called *Shop Talk*, it is celebrating its 10th year on the air — and still finding something new to talk about each week. In addition to notes on new stereo components and explanations of how they work, the program features an unorganized mix of commentary, reviews, humor, phone calls from listeners, and interviews with hi-fi design engineers and other important figures on audio. Two of the program's hosts have participated in *Shop Talk* nearly every week for the past 10 years, audio consultant Peter Mitchell and psychiatrist Richard Goldwater; the program's third resident host, Brad Meyer, joined the show last year.

Among the guests who have been interviewed on *Shop Talk* in recent weeks are AR's chief speaker designer, Tim Holl; analog/digital-circuit designer Rene Jaeger, formerly of dbx and now with Lexicon; and Renaud Delapraz from Studer/Revox in Switzerland. Interviewees scheduled for forthcoming shows include Telarc digital-record producer Jack Renner, *High Fidelity* record reviewer Abram Chipman, and several speaker designers.

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By .

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A plug for the BAS

One of the largest and most fertile groups of audiophiles — apparently second only to the enormous Japan Audio Society in size and vigor — is the Boston Audio Society, membership in which is open to anyone who has $12 and a genuine interest in hi-fi. There are occasional special activities such as equipment test clinics, bulk purchases of recording tape, and hi-fi factory tours, but the central activity of the BAS (apart from its excellent monthly publication, *The Speaker*) is its regular meeting, usually on the third Sunday of each month at a location in Waltham and usually featuring one or more guest speakers from the audio industry detailing the design of a new product and submitting to a barrage of nasty but informed questions from members.

The meetings planned for this year include the following attractions.

March: Stephen Temmer of Gotham Audio, importer of Neumann microphones and record-cutting lathes;

April: Alan Feinstein of Acoustilog, on room reverberation and equalization;

May: Larry Klein, technical director of *Stereo Review* magazine; and, tentatively, a concert to which members will be invited to bring microphones and tape decks for a live recording session;

June: the Scheiber Sonics spatial decoder and other subjects;

July or August: a tour of the Bose factory;

October: Paul Klipsch, legendary designer of the Klipschorn speaker.

For information on joining the BAS, write to the Boston Audio Society, PO Box 7, Boston, 02215.

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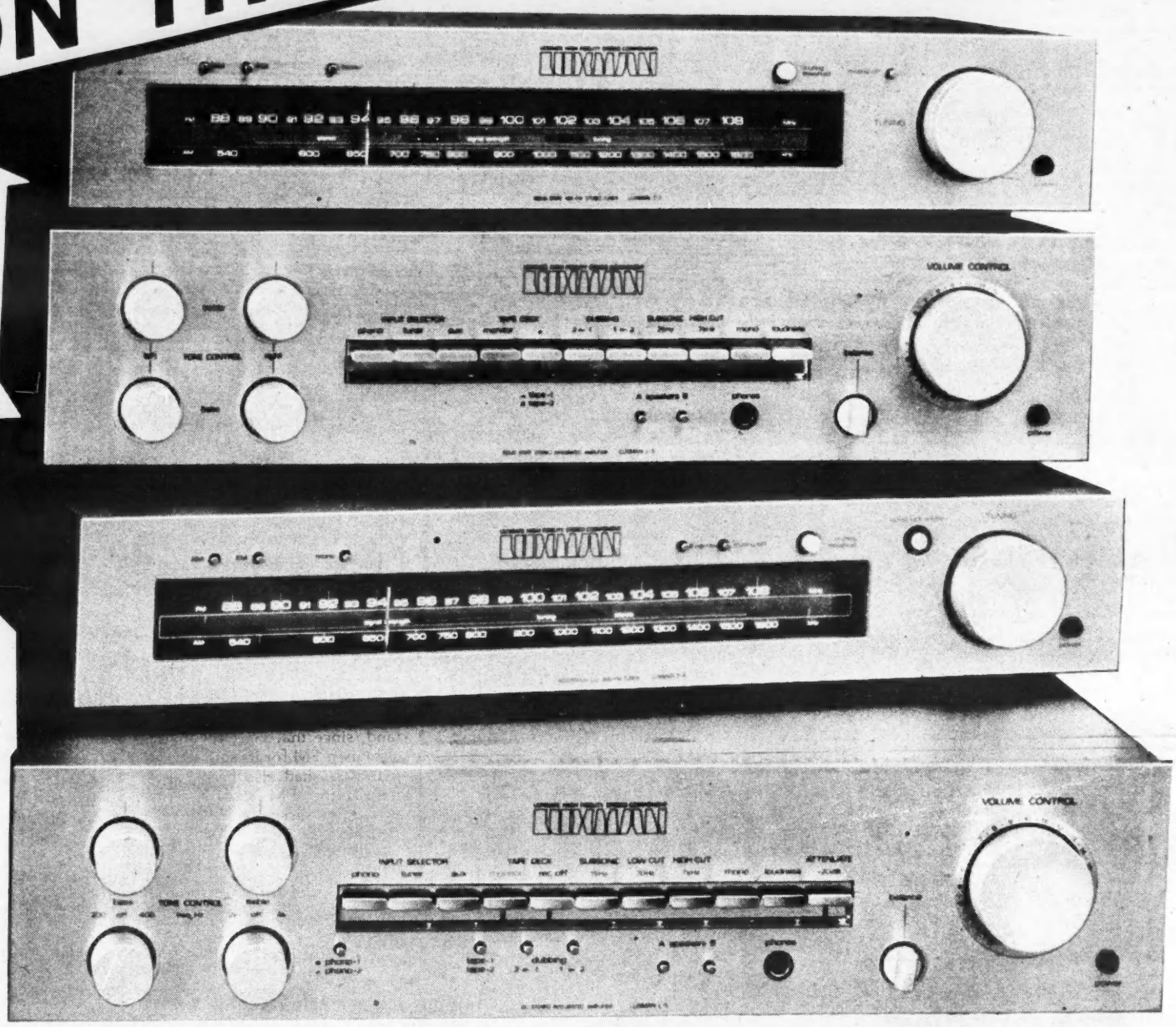

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Electric Gramophone
367 Boston Post Rd. (Rte. 20)
Sudbury, Mass.

Natural Sound
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Formats

Continued from page 8

years. The most significant change came with the introduction, in the late '60s, of "back-coated" tape. These new tapes, while retaining the same oxide formulations, had a layer of a graphite-like substance on the *back* of the tape. This layer, which was as rough as or rougher than the oxide layer on the front, served three purposes: first, it gave the capstans and rollers a better grip on the tape, preventing the tape from slipping off the heads and guides; second, it served to dissipate static charges, so that the tape manufacturers no longer had to dope small amounts of carbon into the oxide layer, as had been necessary to prevent static build-up; and third, in the fast-wind modes, it let air escape between the layers of tape slowly, making for a smoother tape pack.

Our story would be ended here, except that in the late '50s tape-recorder makers got it into their heads that they could sell the public something a little different.

" 'Now even a fumble-thumbs like me can finally play tape!' said a happy housewife," according to an article in a 1959 issue of *High Fidelity*. The major obstacle to tape's taking over the hi-fi market at that time, according to some in the industry, was that you needed a modicum of manual dexterity to thread the things. Horror stories of tape threaded upside down and backwards, or of tape's wrapping itself around capstans or spindles, effectively served to scare off many potential recorder buyers. The introduction of self-threading reels by 3M (Scotch), and even that of a very clever self-threading tape transport by Tandberg, didn't do much to dent the prevailing beliefs. So the industry's designers started working on alternatives. The hands-free cartridge, or magazine, approach seemed to be the logical one, and ideas started to hit the market in 1958.

In June of that year, RCA announced the development of its "Magazine-Loading Stereo Cartridges." These cartridges used standard quarter-inch tape, recorded in quarter-track stereo at 3¾ ips, packed into a self-contained package that looked a little like today's cassettes but measured seven-and-a-quarter by five inches. By that fall, the magazines were available in stores, but there were no machines to play them. Tandberg meanwhile brought out the first quarter-track stereo open-reel machine that could play at 3¾ ips, and it was duly noted in the audio journals that this machine could play the new magazines — *if* they were broken open and the tape wound onto standard reels. This seems ridiculous, but at the time there were no prerecorded quarter-track tapes available, and the idea was taken somewhat seriously. RCA was having a lot of trouble with its machine designs, and Bell Sound got the jump on RCA, marketing a line of six different decks in June of 1959. RCA finally got it together a few months later, and the reviewers who checked out the various machines were pleasantly surprised at the sound quality they were capable of. Some of the new machines were capable of operation at 1⅞ ips, but, as the reviewers noticed, at a substantial sacrifice of fidelity.

In 1962, TelePro introduced a line of endless-loop cartridges for broadcast use. Using quarter-inch tape at 7½ ips in an ingenious little package that flipped the tape over as it ran in a continuous loop, these cartridges were eminently suitable for broadcast use — for advertisements and quick, repeatable announcements. Silent control tones could be recorded on the tape to shut the transport off at a determined point, eliminating the need to rewind, search, and cue the tape. The first cartridges were mono, which was just fine for the broadcasters of the time, but TelePro started to look at other markets. In 1964, it came out with a quarter-track stereo cartridge using the same mechanical principle as the broadcast variety but running at 3¾ ips. There was a problem in using the quarter-track format in that mechanical considerations prevented the cartridge from being turned over, as an open-reel tape could. Therefore, the head assembly itself had to move. This created rather serious problems in that, given the vagaries of small mechanical assemblies, the head and the tape would rarely line up to the .001-inch tolerance that the medium demanded; but TelePro went ahead anyway.

A few months later, Lear Jet brought out a system it had bought from a backyard inventor in Bala-Cynwyd, Pennsylvania, some years before. This system was similar to the TelePro cartridge system, but Lear Jet went one step further and compressed *eight* tracks onto quarter-inch tape, utilizing a sophisticated four-position head mechanism to record and play the things. Originally designed for use as a background-music source in airplanes, Lear Jet's units, as well as TelePro's, became very popular in the automobile market; within a year, there were 10,000 units installed in cars all over the country.

In late 1965, RCA finally gave up the ghost on its magazine-loading cartridge and got behind Lear Jet as a manufacturer of hardware and, more significantly, prerecorded tapes. The four-track/eight-track war went on for a few more years, with the RCA-backed eight-track system finally winning out.

Meanwhile, 3M, whose Scotch recording tape had dominated the industry for years, was busy with its own ideas for a cartridge system. In 1964, in a complicated coproduction venture, Revere introduced a cartridge system that was quite different from the others and had one distinct advantage: its players could stack an unspecified number of carts, and play and reject them, just the way an automatic turntable does with records. This particular system had been developed for 3M by CBS (obviously, in direct competition with RCA) and was then assigned to Revere and marketed under the name of Revere/Wollensak, the latter being 3M's own brand of hardware. These cartridges measured about four inches square and utilized 9/64-inch tape in the half-track stereo configuration, at 1⅞ ips. It was not a success.

Meanwhile, over in Holland, Philips Radio was developing a portable system aimed at the secretary, the student, and the beach-goer. Dubbed the Compact Cassette and marketed under the label of "Norelco Carry-Corder," this format used two monaural tracks on .015-inch tape, in a self-contained cartridge with two built-in hubs that was not unlike RCA's earlier magazines. This system's success, while the others fell by the wayside, resulted from a combination of luck and smart marketing. Norelco's first machines used a sort of joystick to control all functions, giving the unit a manufacturer's holy grail of one-control operation. The heads, albeit small, were fixed, and the mechanism lent itself to stable operation. The speed of 1⅞ ips was a limitation, but the original units were not aimed at high fidelity. The convenience of use and storage was such that the system immediately caught on, and when Wollensak came out with a copy of the Carry-Corder in 1966, Philips knew the format was a winner.

Philips made the wise decision to license other manufacturers to produce cassette hardware and software. Soon, dozens of manufacturers had jumped on the bandwagon, and more advances in head technology, spurred on by burgeoning sales of both blank and prerecorded cassettes, started to push the medium toward high fidelity. Philips eventually agreed to stereo formats in its licensees' machines, maintaining compatibility by placing the stereo tracks adjacent to each other on the tape, rather than alternately, as in quarter-track open-reel. Stereo separation was, as in early stereo open-reel machines, pretty poor, but improvements were possible.

Philips's cassette is designed to accompany only a two-head transport mechanism, and the problem of how to add a third head cropped up as performance demands increased. Eventually, this was solved by miniaturizing the record and play heads to such a degree that they would be combined into a housing that would fit into the space alotted for one head. Dolby noise-reduction and the new tape formulas — chromium-dioxide, ferri-chrome, and, most recently, metal — brought about further improvements in fidelity.

Drastic changes in manufacturing principles were entailed in making the cassette competitive with discs and open-reel tapes, and many of the changes brought about in the struggle benefited other formats as well. Because of the restriction placed on Philips in space and speed, new motors had to be designed (ones that could deliver rock-steady speed), new materials were required for heads, and new bias and equalization were called for. All this new technology soon made its way, in one form or another, into other home audio products, creating even higher standards for cassettes to meet.

In the past year or so, with the expiration of the Philips cassettes patents looming near, manufacturers in the US and Japan are fooling around once again with non-standard tape speeds and track layouts, as well as with more sophisticated (and hence more drastic) noise-reduction systems. For instance, Teac has introduced the first stereo cassette deck on the American market that is capable of recording one channel at a time.

More significant, the company has also brought out the first *four* channel cassette deck, which is combined with a small mixer into a unit being marketed as the PortaStudio. Designed for a very specific, but growing, market, the PortaStudio is for the musician who wants to make multi-track recordings at home. The tape section uses a combination record-playback head, so that there is no synchronization problem, and it operates at 3¾ ips. The layout of the tracks that it records onto the tape is quite different from standard cassette formats. The machine is *not* usable for quadraphonic recording, as it has only two record preamplifiers, and hence will record only two tracks at a time.

It would be marginally negligent to close the book on tape formats without mentioning the Elcaset. In 1974, Sony and a few other Japanese manufacturers came out with this sytem — quarter-inch tape housed in an oversized cassette package and designed to move at 3¾ ips — which was supposed to provide the convenience of cassettes without the inherent drawbacks. Early reports on the format (which bore a remarkable resemblance to the RCA magazines of 15 years before) and the hardware itself indicated that the medium did indeed live up to its promises. The only problem was in convincing tape users to scrap their cassette machines and libraries in favor of the Elcaset system, and the hoped-for stampede never developed. At the Consumer Electronics Shows in Las Vegas and Chicago early in 1979, Elcasets were conspicuous by their absence.

Finally, as we enter the '80s, the tape medium has settled down into two major formats, each one continually experiencing small yet important improvements. But if you think the fight among the various tape formats was something, wait until the video/digital-disc designers start taking their differences before the public, and then watch the bits fly. ●

Decks

Continued from page 6

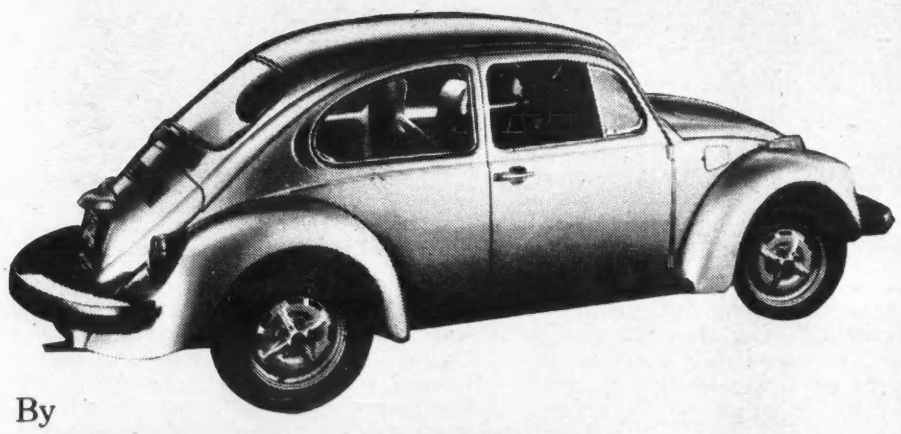
peak-hold metering. At $1550 for the Model 680, you can bet that Nakamichi is still very serious about what it's doing.

Nakamichi is not, however, the only manufacturer to offer non-standard tape speeds for cassette users. BIC markets a line of decks that operate at 3¾ ips, double the normal speed, and Marantz has incorporated the non-standard speeds into some of its cassette-deck designs.

Eumig, an Austrian company that keeps a low profile in North America, isn't doing anything that Philips wouldn't approve of, but has, for the past few years, been trying to involve the cassette medium in an area that has studiously avoided it — broadcasting. Since radio demands that a record be able to be cued and a tape readily edited, cassettes traditionally have been used only for air checks — two-minute recordings of air product to prove to a sponsor that his spot was aired — and many stations don't even own a cassette deck. Eumig has developed a system as part of its FL-1000 deck that uses an etched disc attached to the capstan in combination with a photocell to provide for low wow and flutter, high-speed accuracy, and, the company claims, precise selection location — in other words, tight cueing. Added to this, Eumig's FL-1000 has a built-in microprocessor that can be hooked up with any eight-bit minicomputer, so that the programing of selections played by the machine (or any combination of machines) can be decided long in advance. This feature, it is hoped, will be attractive to automated broadcasting stations, who, after they buy the FL-1000, can then fire even more personnel and dispose of the bulky Scully 14-inch open-reel machines traditionally used for background music. At $1550 each, a set of four FL-1000s would put enough disc jockeys out of work to pay for itself in a month. As an added bonus, the deck doesn't even require all the attentions of a maintenance engineer — its microprocessor automatically

Continued on page 34

DEPENDABILITY



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9	10	11 **Yamaha Clinic** Comm. Ave Store	12 **Dual Clinic** Comm. Ave Store **Yamaha Clinic** Framingham Store	13 **Yamaha Clinic** Nashua Store	14 **Dual Clinic** Harvard Square Store **Yamaha Clinic** Burlington Mall Store	15
16	17 **Yamaha Clinic** Worcester Store **Nakamichi Clinic** Providence Store	18 **Dual Clinic** Burlington Mall Store **Yamaha Clinic** Harvard Square Store **Nakamichi Clinic** Comm. Ave Store	19 **Dual Clinic** Worcester Store **Yamaha Clinic** Manchester Store **Nakamichi Clinic** Nashua Store	20 **Yamaha Clinic** Chestnut Hill Store **Nakamichi Clinic** Harvard Square Store	21 **Yamaha Clinic** Providence Store **Nakamichi Clinic** Framingham Store	22
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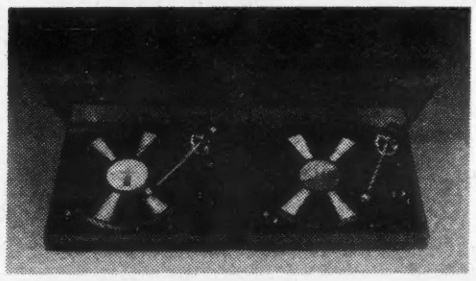
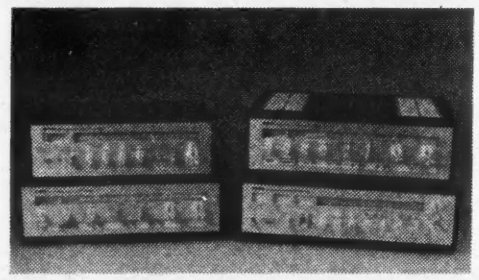


Turntables - Dual

The people from Dual will test your turntable (and cartridge) for stylus wear, turntable speed, balance, phase and trackability. They will also adjust tracking and anti-skating controls for optimum performance. Only turntables with magnetic cartridges can be tested. Cartridges without turntables also cannot be tested.



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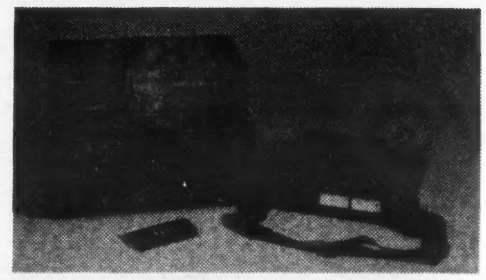

Cassette Decks - Nakamichi

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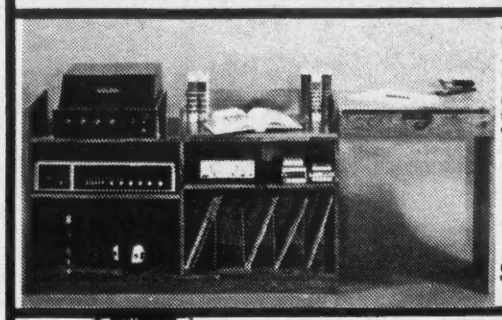

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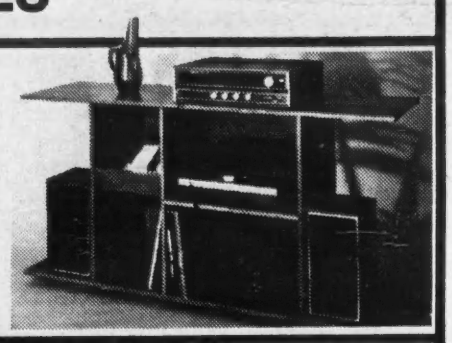

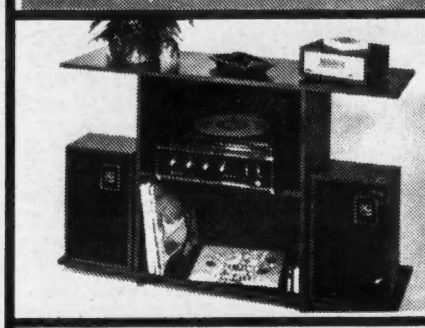

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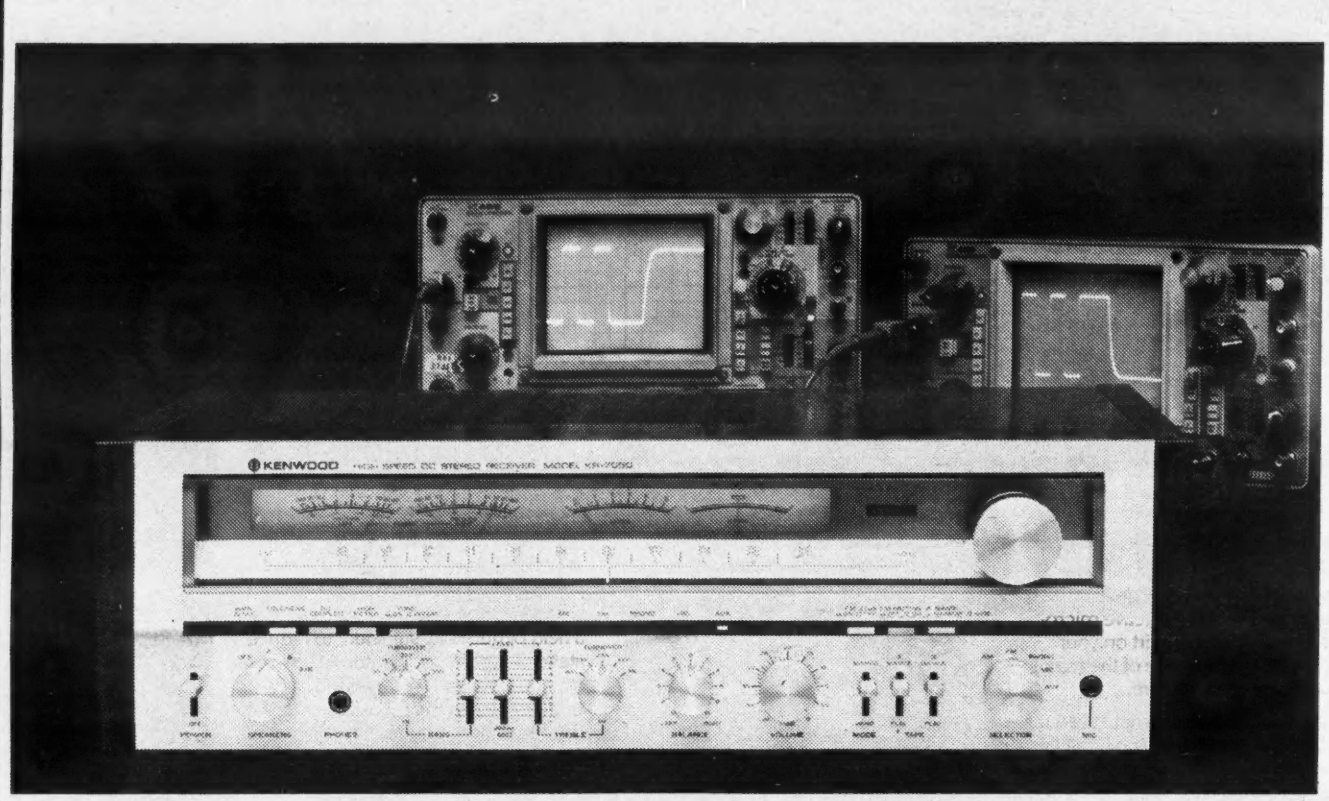


INDEPENDENT TEST REPORT: KENWOOD HAS BETTER TRANSIENT RESPONSE THAN PIONEER,* TECHNICS* OR YAMAHA.*

Recently, we asked an independent testing laboratory to measure Kenwood's new Hi-Speed™ receiver against the competition. Each one "off the shelf" in unbroken factory cartons.

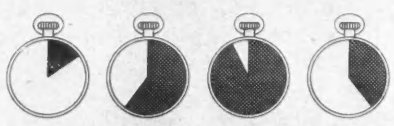
The results were impressive, if not surprising.

The Kenwood receiver outperformed comparable models of other brands in both rise time and slew rate, the same new specifications that are used to measure a receiver's ability to handle complex musical signals.

Of course, the Kenwood receiver had one unfair advantage: Kenwood's exclusive Hi-Speed circuitry. Hi-Speed allows an amplifier section to react faster to changes in music to minimize audible transient intermodulation distortion.

In the laboratory, this shows up as superb specs and an almost perfect square wave on an oscilloscope.

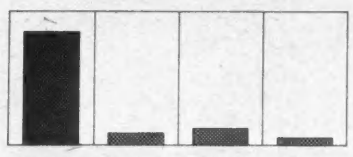
RISE TIME (5 MICROSECOND CLOCK)



KENWOOD KR-7050	PIONEER SX-980	TECHNICS SA-700	YAMAHA CR-1040
.85 μs	3.0 μs	4.60 μs	2.00 μs

In your home, you'll hear superior clarity and definition with excellent imaging. For example, you'll be able to identify an individual singer in a vocal group.

SLEW RATE MEASUREMENT RESULTS



KENWOOD KR-7050	PIONEER SX-980	TECHNICS SA-700	YAMAHA CR-1040
200 V/μs	20 V/μs	29.4 V/μs	10.7 V/μs

Your Kenwood dealer can show you the entire line of Hi-Speed receivers.

Because if you're going to buy a receiver, why not go with the best performer?

HI-SPEED™

Hear the future of high fidelity

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In Canada: Magnasonic Canada, Ltd. / Test data available upon request.
Rise time and slew rate measured by slope at zero crossing method.

Decks

Continued from page 32

tunes the record bias.

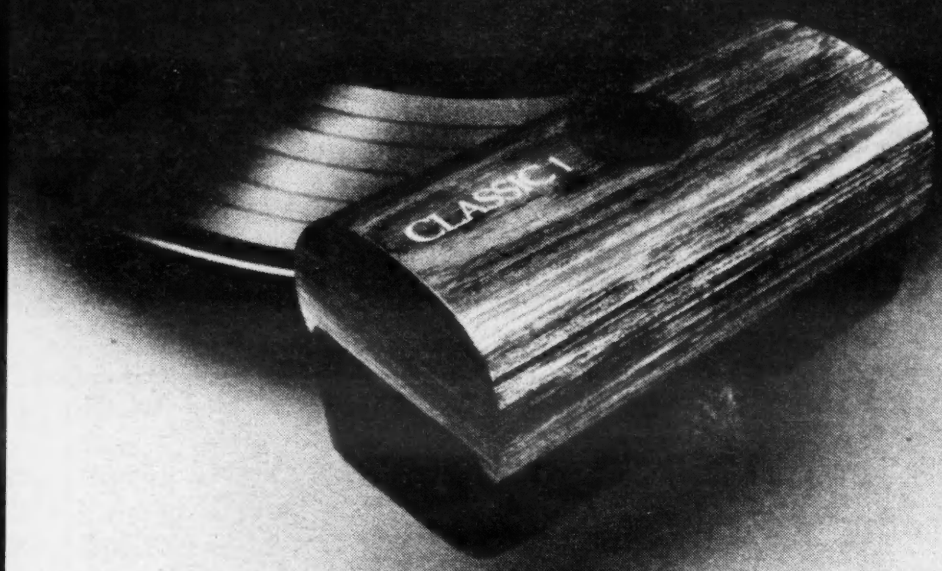
Dual is a German company also not well-known for its cassette equipment, although its turntables have had a devoted following since before the cassette was invented. Nonetheless, the company has been quietly selling high-end cassette decks for some five years and been incorporating some unusual features, one of which would seem to make Philips just a little nervous. The latest in the line, the 839RC, includes such goodies as wireless remote control, variable playback speed, automatic fade (for editing out radio commercials), stereo limiting, and the questionable ability to allow the user to rip out the cassette while it is moving and reinsert another without touching any of the transport controls. Another strange feature is Dual's *six*-position bias/EQ switch, which is factory-adjusted for two types of standard tape, two types of chrome tape, and one each of ferri-chrome and metal. The kicker, however, is that the 839RC can record and play back in *two* directions — a feature previously available only on reel-to-reel decks. The standard setup for bi-directional recording is to use five heads — one playback, two erase, and two record heads. The physical constraints of the cassette, however, won't allow this, and so Dual has included a four-track combination record/play head, whose stereo pairs are switched electronically, flanked by two erase heads. (Some manufacturers insist that it is impossible to build a combination record/play head that can handle enough bias to get maximum use out of metal tape, but Dual has no comment on this objection.) With the current design, obviously, Dual's 839RC can play only in stereo, but now that the four-track is being manufactured, it's a very small step to quadraphonic. The 839RC retails for a measly $850.

Sharp Electronics Corporation introduced the first cassette deck with a built-in programmable search system a few years back, and as the cost of microprocessor chips has come down, the programers have become more sophisticated. Since people often associate the Sharp name with calculators and inexpensive cassette portables, the company named its high-end line Optonica. The Optonica RT-6905, an $1800 investment, is, sonically speaking, a fairly straightahead high-end cassette deck, but it contains an imposing-looking automatic programer/timer, the capabilities of which are staggering. The programer includes four tape-counter memories, automatic search, automatic four-second spacing, 15-selection automatic sequencing, and the capacity for remembering 42 instructions spaced out over a week's time. The programer can even be used to control electric devices other than the cassette deck, like lights or a toaster. The unit's digital readout can be used as a clock, a timer, or a stopwatch, and special circuits prevent the memory from dumping in case of a power failure. The RT-6905 also makes a dandy alarm clock.

Tandberg, a Norwegian company that had financial troubles not long ago, has jumped back into the tape-recording market with a whole slew of new designs. It's incorporating into its decks two new, patented circuits which are designed to squeeze more high-end signal onto the tape before it saturates, and which therefore act as one-way noise-reduction systems. Tandberg's Actilinear circuit is a design that operates recording amplifiers at a lower-than-usual voltage, thereby increasing headroom and lowering amplifier rise

Continued on page 40

discover . . .



The inside story of a classic.

Introducing a new type of record cleaner. Meet the CLASSIC 1, the only cleaner of its kind. Developed to satisfy you, the discriminating audiophile.

Neutralizing the static charges that attract and hold destructive micro-particles of dust and dirt on your record's surface is one of the major problems in record care.

Ordinary cleaners attempt to reduce static charges by applying fluid directly to the surface of the record or cleaning unit. Direct application of fluid involves an inherent risk of harmful residue build-up and should be avoided except in the case of abnormally dirty or greasy records. In fact, normal maintenance should not involve wetting the record.

At last, the CLASSIC 1 has the answer to safe and effective cleaning. Not only are static charges reduced, but the problem of residue formation is eliminated. Cleaning is safe and effective because inside the CLASSIC 1 is

the exclusive MICRO STOR SYSTEM which utilizes a humidification/cleaning process rather than a 'wet' technique.

The secret to the MICRO STOR SYSTEM is a permeable matrix of many thousands of tiny glass beads which retain the cleaning fluid. Through capillary action, a vapor penetrates the velvet surface creating a field of humidity sufficient to reduce static charges. Disc contaminants can now be removed safely and easily without wetting the record and risking residue build-up.

Discover the ultimate in record care. The CLASSIC 1, a Sound Saver product. Available at finer audio dealers . . .

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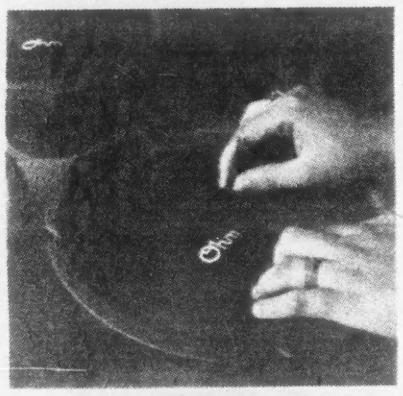
Ohm's Law 9:

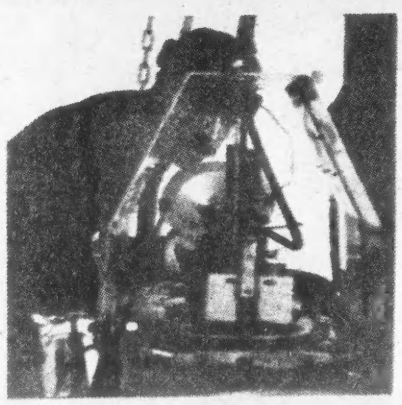
It is possible to make a loudspeaker that gets loud and still sounds good.

Ohm introduces another new loudspeaker that defies the traditional laws of loudspeaker design. The new Ohm I.



It used to be, if you liked listening to music as loud as life in your home, you had a tough choice to make. You could buy high efficiency "monster" systems, and put up with the boom and shriek. If you wanted something smoother (with really deep bass), you could buy low efficiency systems, but then you'd need an amplifier big enough to power Toledo.

The Ohm I solves the problem. It can achieve concert hall levels in your home effortlessly, with *no* sacrifice in bandwidth, linearity, or imaging abilities. While the Ohm I gets amazingly loud with as little as 10 watts input, it can handle 1000 watts comfortably.



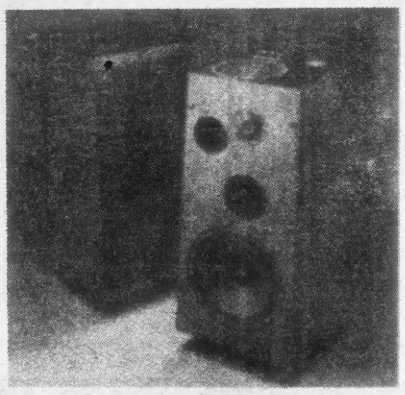
It's the world's first *good and loud* loudspeaker.

Inside the Ohm I, you'll find everything we've learned about multi-driver dynamic loudspeaker design. It uses a total of five drivers, including a 12-inch, optimally-vented subwoofer with an incredible 72 ounce magnet. Voice coils are cooled by magnetic fluid to increase power handling. The Ohm I's beautifully-finished, floor-standing enclosure is compact enough to fit gracefully into any home.

The new Ohm I's are already earning rave reviews from stereo critics. After listening to them, **The Complete Buyer's Guide to Stereo/Hifi Equipment** says, "The volume level was approaching the threshold of pain, but the speakers were showing no sign of strain. The response, regardless of level, was smooth and free from annoying colorations...Too often a loud loudspeaker is deficient in many other areas. Fortunately, this is not the case with the Ohm I...."

According to **Hifi Stereo Buyer's Guide** (8/79), the new Ohm I has "...a combination of efficiency and power handling that, as far as we know, is unmatched." They continue: "(The Ohm I) is one of the finest speakers we've ever heard. There is nothing it couldn't do and do it superbly...it thundered out the lowest pipe-organ pedal notes in a way that made us feel we were in a great cathedral...When appropriate, the bass was discreet. It was all there, without saying 'Here I am'.... The treble filled the room with a spacious sweetness that seemed...downright seductive...(The Ohm I) will bring out the best from any program material and will also do justice to the coming glories of digital recording... this is a speaker with a future – for the future."

For a listening experience you've never enjoyed before except at a live performance, visit your local Ohm dealer. Ask to hear the world's first good and loud loudspeaker: the new Ohm I.



For 16 complete reviews, and full specifications, please write us at: Ohm Acoustics Corp., 241 Taaffe Place, Brooklyn, N.Y. 11205.

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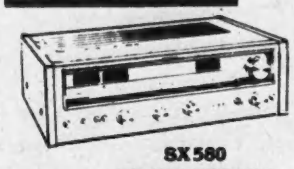
Receivers

PIONEER

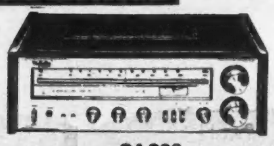


SX 580
AM/FM STEREO RECEIVER
Thrusting 20 watts per channel RMS (FTC rating).

PHILIPS

AH 7841
AM/FM STEREO RECEIVER
Delivering 20 watts per channel RMS (FTC rating).

Technics



SA 200
AM/FM STEREO RECEIVER
Pushing 25 watts per chanel RMS (FTC rating).

Turntables

PHILIPS **AF 685 BELT DRIVE TURNTABLE**

Manual with automatic shut-off. Includes base & dust cover.

Technics **SL B1 BELT DRIVE TURNTABLE**

Features S-shaped tone arm. Includes base & dust cover & many more demanded features.

PIONEER

PL 512 BELT DRIVE TURNTABLE

With WOW & flutter 0.55% with cue & mechanism. Includes base & dust cover.

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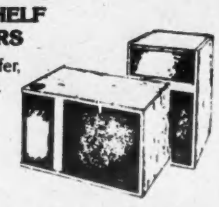
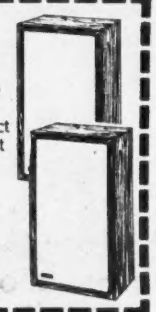
BOSE

301 Direct Reflecting BOOKSHELF SPEAKERS
With 8" woofer, 1¾" tweeter.



ADVENT



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4B 10", 3-Way SPEAKER SYSTEM
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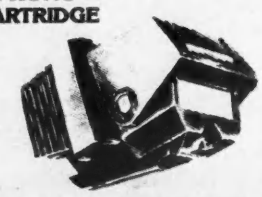

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Power stereo package includes Technics SA 500 AM/FM stereo receiver delivering 55 watts per channel min. continuous "RMS" into 8 ohms, both channels driven, from 20-20,000 Hz, with no more than 0.04% total harmonic distortion. Also features LED power level display. The innovative design of the famous Bose 601 direct-reflecting loudspeakers ensure accurate reproduction and minimum distortion. Technics SLQ 2 is a semi-automatic Quartz-Phase-Locked direct-drive turntable with superior specifications. Includes base and dust cover. Professional quality, light-tracking Stanton 681 Triple-E cartridge completes this state-of-the-art system.

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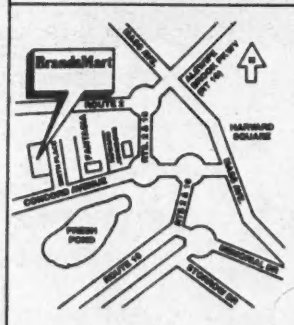

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Top-of-the-line components are featured in this state-of-the-art stereo system. The Sansui G5700 AM/FM stereo receiver delivers 75 watts per channel RMS (FTC Rating) with a scant .03% total harmonic distortion. The Bose 901 direct-reflecting speakers add spaciousness and dimension to any room. The Philips AF 977 is an electronically controlled belt-drive fully-automatic turntable with photo-electric shut-off. Base and dust cover included. The final element is the Shure V 15 IV top-of-the-line stereo phono cartridge.

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Complete Stereo System

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Concerts

Continued from page 12

form Haydn's Quartet in E-flat Major, Mozart's Quartet No. 22 in B-flat Major, Beethoven's Quartet No. 4 in C minor, and Shostakovich's Quartet No. 8.
8:00 (WGBH and WCRB) BSO (live). See the listing for Friday, April 11, at 2 p.m.

Sunday, April 13

1:00 (WGBH) Boston Artists Ensemble. The Ensemble perform Smetana's String Quartet No. 1 (*From My Life*).
2:00 (WBUR) Sunday Opera. A Rachmaninoff triple bill: Rouslan Raychev directs a performance of *Aleko*, Mark Ermler conducts *Francesca da Rimini*, and a performance of *The Covetous Knight*.
3:00 (WHRB) Live at Passim. Dave van Ronk performs his folk blues in concert.
8:30 (WCRB) Sunday Evening at the Opera. In a Delta Opera House production, Georg Solti conducts Humperdinck's *Hansel and Gretel*, with Fassbaender, Popp, Schlemm, and Berry as soloists.

Monday, April 14

8:00 (WCRB) Concert Hour. An all-Mozart program: Goldberg performs the Violin Sonata in E-flat, the Vienna Mozart Ensemble perform Six Minuets, and a performance of the Piano Quintet in E-flat.
9:00 (WCRB) Baltimore Symphony. Sergiu Comissiona conducts Mozart's Symphony No. 28, Lazarov's Concerto for Orchestra, and Ravel's *L'enfant et les sortileges*.
9:00 (WHRB) Luise Vosgerchian in Concert. With James Yannatos conducting the Harvard-Radcliffe Orchestra, Vosgerchian performs Stravinsky's Capriccio for Piano; with cellist Siegfried Palm, she performs Mendelssohn's Sonata in D for Cello and Piano; and with the Harvard-Radcliffe Chorus and the Bach Society Orchestra, she performs Beethoven's *Choral* Fantasy.

Tuesday, April 15

8:00 (WCRB) Concert Hour. Beck performs William Billings's Four Organ Pieces, the Western Wind perform Four Songs by Billings, and Ormandy conducts the Philadelphia Orchestra in William Schuman's *New England Triptych (after Billings)*.
9:00 (WCRB) Chicago Symphony. Claudio Abbado conducts Haydn's Sinfonia Concertante in B-flat and Mahler's Symphony No. 5.
11:00 (WBUR) Jazz Alive! From Northridge, California, performances by drummer Frank Capp and the Juggernaut Band with pianist/arranger Nat Pierce, the Bill Berry Big Band, the Bobby Shew Quartet, and a solo performance by song stylist Dave Frishberg.

Wednesday, April 16

8:00 (WCRB) Concert Hour. Szell conducts the Cleveland Orchestra in Wagner's *Faust* Overture, Bernstein conducts the New York Philharmonic in Wagner's *Tristan and Isolde*: Prelude and *Liebestod*, and Munch conducts the BSO in Wagner's *Tannhaeuser* Overture.
9:00 (WCRB) Cleveland Orchestra. Andrew Massey conducts Mendelssohn's *Ruy Blas* Overture, Sibelius's Violin Concerto, with Ida Haendel, and Dvorak's Symphonic Variations.

Thursday, April 17

8:00 (WCRB) Concert Hour. Krueger conducts the Royal Philharmonic Orchestra in Paine's *As You Like It* Overture, and Schuller conducts the St. Louis Symphony Orchestra and Chorus in Paine's Mass in D.
9:00 (WCRB) New York Philharmonic. Zubin Mehta conducts Nono's *Per Bastiana Tai-Yang Cheng*, Mahler's Songs to Poems by Friedrich Rueckert, with soprano Jessye Norman, and Brahms's Symphony No. 4.
11:00 (WBUR) Jazz at the Church (live). Alida Rohr, Chris Brooks, and friends perform original compositions, plus Billie Holiday material.

Friday, April 18

2:00 (WGBH) BSO (live). Seiji Ozawa conducts Bach's *Musical Offering* (orchestrated by Webern), the world premiere of Chihara's Saxophone Concerto, with Harvey Pittel, and Beethoven's Symphony No. 6 (*Pastorale*). Repeated on WCRB and WGBH Saturday, April 19, at 8 p.m.

Saturday, April 19

11:00 a.m. (WGBH) Live Performance Series. "Gemini." Laszlo and Sandor Slomovits perform traditional folk music and some of their own compositions.
2:00 (WCRB) Metropolitan Opera (live). From Lincoln Center, the final broadcast of the season: Raymond Leppard conducts Britten's *Billy Budd*, with Stilwell, Cassilly, Morris, and Glossop as soloists.
8:00 (WCRB and WGBH) BSO (live). See Friday, April 18, at 2 p.m.

Sunday, April 20

1:00 (WGBH) Boston Artists Ensemble. The Ensemble perform Mozart's String Quintet in C, K. 515.
2:00 (WBUR) Sunday Opera. Herbert von Karajan directs this performance of Debussy's *Pelleas et Melisande*, with Von Stade, Stilwell, Denize, and Van Dam as soloists.
3:00 (WHRB) Live at Passim. A folk concert by Dave Mallett.
6:00 (WBUR) Swedish Soloists. Christer Torge, trombone, performs Wagenseil's Concerto for Trombone and Organ, Koch's *Monologue No. 8*, and Eklund's Trombone Concerto.

Monday, April 21

8:00 (WHRB) Chamber Concert (live). The Beaux Arts Trio perform an all-Beethoven concert that includes the *Kakadu* Variations, and the *Archduke* Trio.
9:00 (WCRB) Baltimore Symphony. Sergiu Comissiona conducts Weber's *Abu Hassan* Overture, Mozart's Piano Concerto No. 22, with Ohlsson, and Liszt's *Faust* Symphony.

Tuesday, April 22

9:00 (WCRB) Chicago Symphony. Erich Leinsdorf conducts the Chicago Symphony Orchestra and Men's Chorus in Richard Strauss's *Die Tageszeiten* and *Le Bourgeois Gentilhomme*.
11:00 (WBUR) Jazz Alive! Alto saxophonist Art Pepper and his quartet perform at the Jazz Showcase in Chicago, and pianist Tommy Flanagan and bassist Will Austin perform at the Detroit Institute of Arts.
1:00 a.m. (WCRB) Through the Night. "Shakespeare's Annual Birthday Special." The special includes Lombard conducting the Paris Opera Orchestra in highlights from Gounod's *Romeo and Juliet*, Berman performing the Piano Suite from Prokofiev's *Romeo and Juliet*, Rostropovich conducting the London Philharmonic in Tchaikovsky's *Romeo and Juliet* Overture, and Ozawa conducting the BSO in Berlioz's *Romeo and Juliet*.

Wednesday, April 23

9:00 (WCRB) Cleveland Orchestra. With pianist Janina Fialkowska as soloist, John Mauceri conducts Hindemith's *Sinfonia Serena*, Szymanowski's Symphony Concertante, and Ravel's *La Valse*.

Thursday, April 24

Noon (WGBH) MusicAmerica (live). Pianist Harvey Jacobson performs the solo-piano music of Scott Joplin, from the studio.
9:00 (WCRB) New York Philharmonic. Zubin Mehta conducts Chopin's Piano Concerto No. 1, with Murray Perahia, and Bruckner's Symphony No. 9

Friday, April 25

2:00 (WGBH) BSO (live). Seiji Ozawa conducts the last concert of the season: Mahler's Symphony No. 7 (*Song of the Night*). Repeated on WCRB and WGBH Saturday, April 26, at 8 p.m.

Saturday, April 26

2:00 (WCRB) Chicago Lyric Opera. A performance of Verdi's *Simon Boccanegra*.
2:00 (WBUR) World Concert Hall. Michael Tilson Thomas conducts the Los Angeles Philharmonic in Beethoven's *Leonore* Overture No. 3, Berg's Three Pieces for Orchestra, Shostakovich's Cello Concerto in E-flat, with Ronald Leonard, and Tchaikovsky's *Romeo and Juliet*.
8:00 (WGBH and WCRB) BSO (live). See Friday, April 25, at 2 p.m.

Sunday, April 27

1:00 (WGBH) Boston Artists Ensemble. The Ensemble perform Dvorak's String Quartet No. 12 (*American*).
2:00 (WBUR) Sunday Opera. Georg Solti conducts this performance of Mozart's *Don Giovanni*, with Weikl, Price, Sass, and Bacquier as soloists.
8:30 (WCRB) Sunday Evening at the Opera. Gardelli directs the Royal Philharmonic Orchestra in Verdi's *I Lombardi*, with Deutekom, Raimondi, and Domingo as principals.

Monday, April 28

9:00 (WCRB) Baltimore Symphony. John Nelson conducts Berlioz's *Beatrice et Benedict* Overture, Strauss's *Le Bourgeois Gentilhomme* Suite, and Dvorak's Symphony No. 6.
9:00 (WHRB) Evening Concert. James Yannatos directs the Harvard-Radcliffe Orchestra and Collegium Musicum, the Harvard Glee Club, and the Radcliffe Choral Society in Verdi's Requiem.

Tuesday, April 29

9:00 (WCRB) Chicago Symphony. Georg Solti conducts Elgar's *Pomp and Circumstance* March No. 4, Beethoven's Symphony No. 6 (*Pastorale*), Tchaikovsky's *Nutcracker* Suite, and Suppe's *Pique Dame* Overture.
11:00 (WBUR) Jazz Alive! Belgian guitarist, harmonica genius, and jazz whistler Toots Thielemans performs with his rhythm section at Sandy's Jazz Revival, and the Texas Tenors, Arnette Cobb and Buddy Tate, perform from the Keystone Korner in San Francisco.

Wednesday, April 30

9:00 (WCRB) Cleveland Orchestra. Lorin Maazel conducts a new work by Bamert, Walton's Violin Concerto, with Daniel Majeske, and Strauss's *Don Juan*.

MAY

Sunday, May 4

1:00 (WGBH) Boston Artists Ensemble. The Ensemble perform Debussy's String Quartet.

Tuesday, May 6

11:00 (WBUR) Jazz Alive! "The Moers New Jazz Festival, 1979." This festival brings together jazz artists from Europe, the US, and Japan, with a special feature on pianist Alexander von Schlippenbach's Globe Unit Orchestra.

Wednesday, May 7

9:00 (WCRB) Cleveland Orchestra. With violinist Daniel Majeske and pianist Joela Jones, Leonard Slatkin conducts Purcell's *Fantasia on One Note*, Berg's Chamber Concerto, and Sibelius's Symphony No. 2.

Sunday, May 11

1:00 (WGBH) Boston Aritsts Ensemble. The Ensemble perform Beethoven's String Quartet No. 3.
3:00 (WHRB) Live at Passim. A folk concert by Bill Staines. ●

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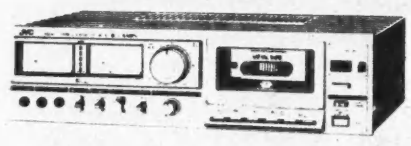

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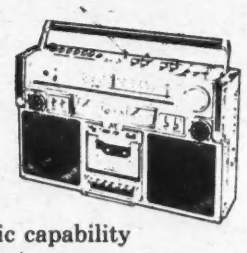

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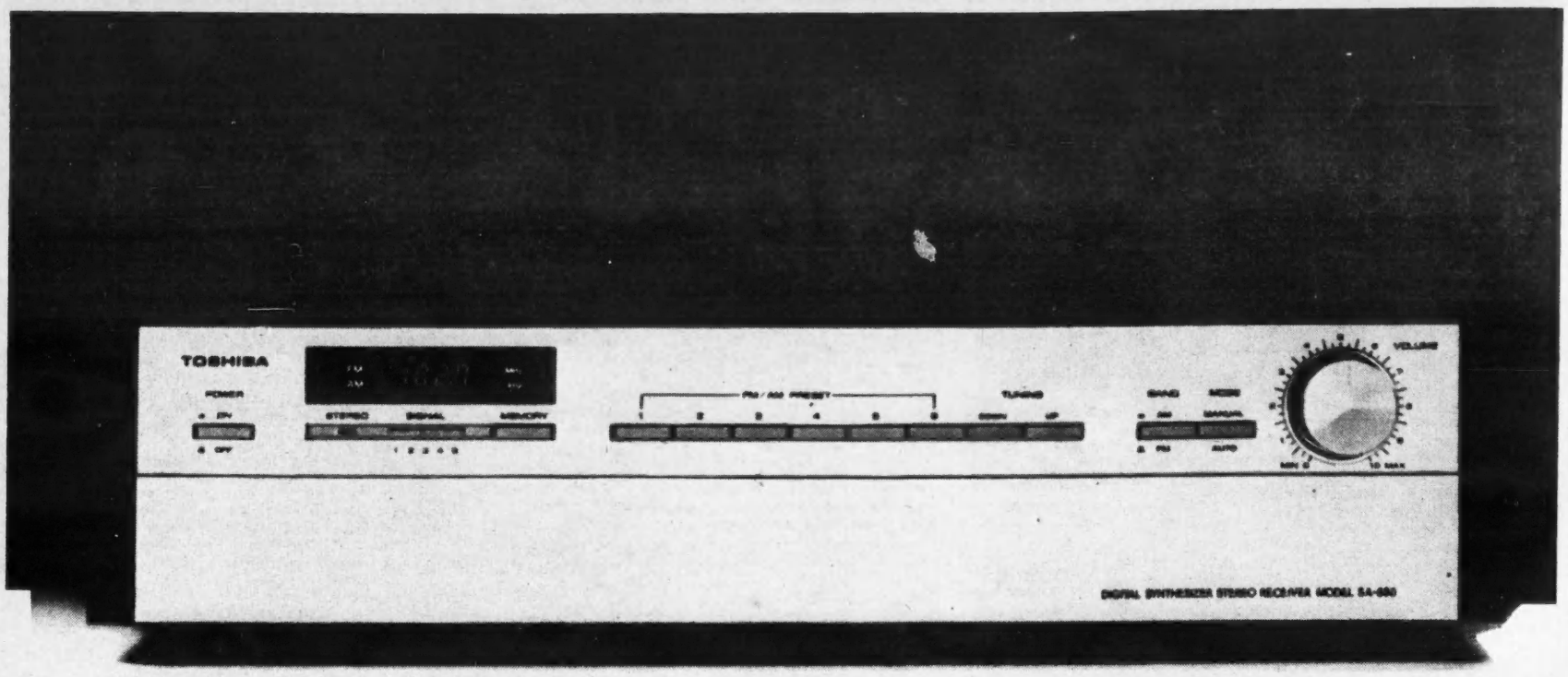

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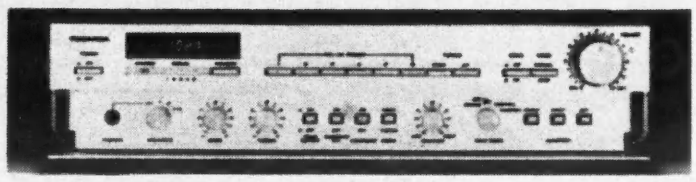

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But we've saved the best part for last. This digital-synthesized receiver actually costs only $519.95,* less than you'd pay for a digital-synthesized tuner alone.

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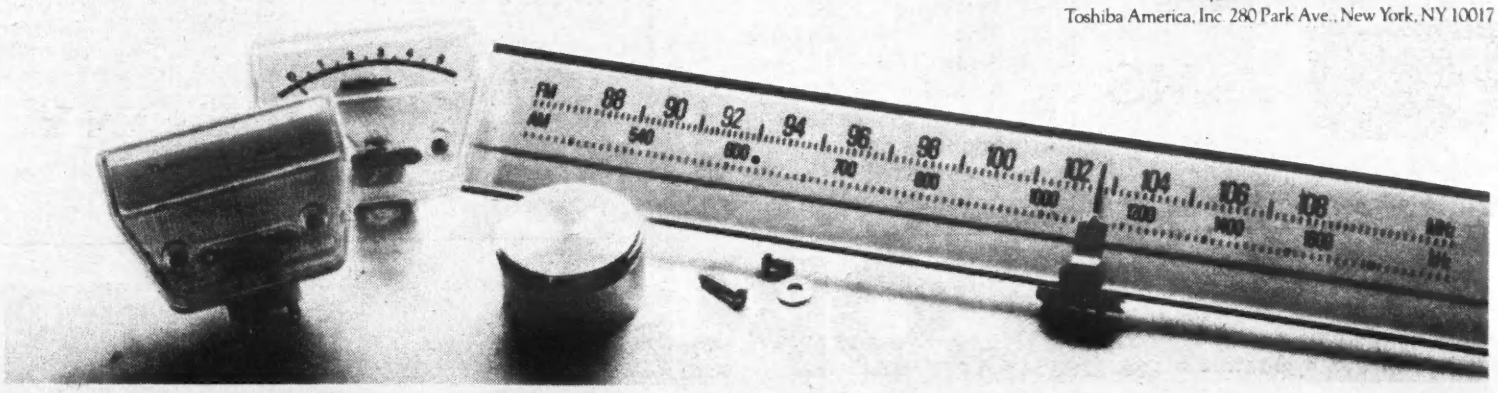

Decks

Continued from page 34

time so as to introduce less distortion into fast waveforms. The newer Dyneq (pronounced "*dy*-nek") system is similar to Dolby's forthcoming HX system, which varies recording bias in step with the high-frequency signal. Dyneq, however, flattens out high-frequency equalization at high dynamic levels, acting as a sort of limiter, to allow more high-frequency signals to pass through the recording amplifiers without overloading the tape.

In May of 1979, Tandberg issued a position paper detailing its "go-slow" stance on the introduction of metal-compatible decks, on the basis that the metal-tape samples it had tested were too inconsistent to justify marketing "$1300 educated guesses." The new Tandberg Model 440A is the first fully metal-compatible deck from that company, and it includes both the Actilinear and the Dyneq circuits. It costs $1600. An optional wireless remote control is $150.

This fall, Tandberg plans to introduce the Model 3004, which will include something called "digital-error detection," a transport that uses stainless-steel pins to lock the cassette in place (therefore effectively taking the relatively unreliable cassette shell out of the transport system), and a monitorable variable-speed fast wind, which enables the user to locate spots on the tape quickly for editing — a feature usually associated with professional reel-to-reel decks and cheap Sonys. The 3004, when it becomes available, will set you back $2600.

Finally, Teac has been flouting Philips's guidelines right and left, quite literally. Its 124 Syncaset is the first cassette machine to make it out of Japan that can record individual channels one at a time. Using a self-synchronization circuit similar to those used in professional recording machines, the unit aims to provide the musician with an easy method of producing a single-overdub demo tape; it even provides a "cross-feed" circuit, for softening the separation between the two channels, so that the tape doesn't sound like "two-track mono." The machine could easily be used for other purposes, however, and in the stereo mode it is completely compatible with other cassette decks. It costs $450.

The Teac 144 PortaStudio goes on to break as many rules as it can. The only thing this unit has in common with other machines is that it uses cassettes. It runs at 3¾ ips *only*, has non-defeatable Dolby, and is sort of quadraphonic. The track layouts it prints on the tape do not match those on any other cassette machine, and while it can play back four channels at a time, it can record only two. Teac says that Philips allowed the marketing of the 144 because, according to one spokesman, "it was so completely different, there was just no question of compatibility in the first place." The 144, complete with built-in four-channel mixer, goes for about $1100.

Teac has made no secret of its preference for dbx as a noise-reduction system (witness that system's inclusion in the company's semi-pro open-reel decks), and there is really nothing stopping Teac from including dbx in its next generation of cassette decks.

Philips's concern with compatibility has generally served the cassette world well, but in hard truth, the usefulness of the compatibility requirements is dying a natural death right along with the patents' more legislated demise. Cassette recording in the 1980s is generally recognized as being applied 90 percent of the time to copying discs and preserving FM broadcasts. The other 10 percent falls to musicians and other media types exchanging cassettes for the purpose of displaying material — and super fidelity is not a consideration for them.

The prerecorded-cassette market has seldom been treated seriously enough by either the record companies or the consumers; one year after the introduction of metal tape — the first medium that can easily compete with discs in the crucial area of signal-to-noise capabilities — there are no prerecorded metal tapes available. The metal-tape phenomenon, in point of fact, may turn out to be singularly unimportant — the majority of "metal-ready" decks are being sold in the lower (below $600) price range, and tests show that they hardly use the new medium correctly. Signal-to-noise figures on these machines using metal tape are insignificantly better, if at all, than the same machines using chrome-equivalent tape.

For the home recordist interested in maximum fidelity, compatibility has been a problem, Philips notwithstanding. Microscopic differences in head height or azimuth between cassette decks from different manufacturers can have a devastating effect on high-end response, while transport-speed differences of one percent or more are not uncommon. And there is no way that Philips or anyone else can regulate these factors.

The audiophile will always buy the best deck he can afford, and will try to use it in such a way as to get the best sound out of his particular machine. If his neighbor has an identical machine, so much the better; but if not, nothing will stop him from copying his discs at 3¾ ips, using High-Com II and dbx noise-reduction, in reversible quadraphonic, if that's what he wants to do. ●

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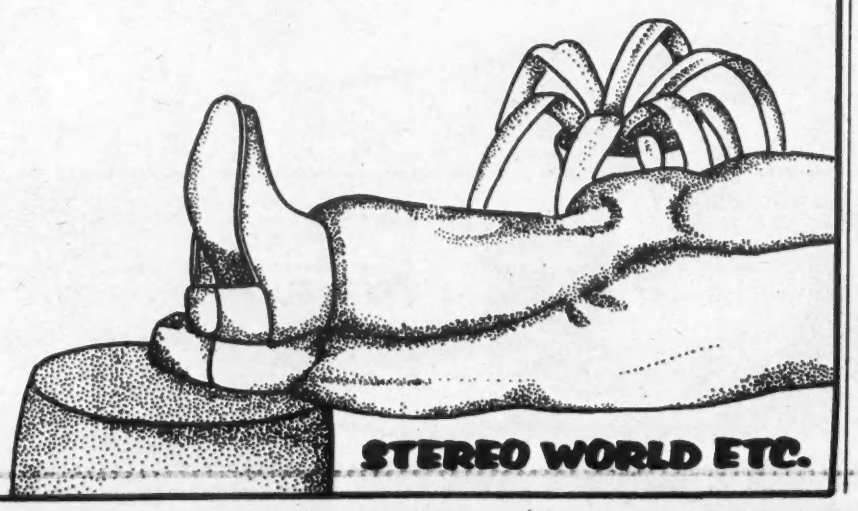

Mitchell

Continued from page 10

managed by the Japanese executives or by you?

A: That was managed 100 percent by me, but there was a great deal of discussion about why US Pioneer and not Pioneer/Tokyo should acquire Phase Linear. I think that's when I began to realize that my view of US Pioneer (and of my role) was probably somewhat different from their view. The idea of any branch other than US Pioneer making that acquisition seemed strained to me, but not to them. I also wanted to build some factories over here, but they said, "We run the factories and you run the American sales and marketing," while my view was, "You run the international corporation and I'll run the corporation's North American activities." Nobody was right or wrong, it's just that we were uncomfortable with each other's views.

Q: *As you left Pioneer, did you have a clear intention of becoming the head of another major hi-fi company, or had you decided to freelance as a consultant?*

A: Neither. The way I make decisions is to float up every imaginable option — whether far-fetched, ridiculous, easy, or obvious — and sift through them. I was dealing with a wide range of things: retirement, General Motors, retail stores, computers, video discs, the music business.

Q: *Were you actively considering offers from other companies when you decided to take the job at Advent?*

A: Yes, several. I hope I didn't make any enemies in the process.

Q: *Did Advent come looking for you, or did you cast out feelers to several companies looking for opportunities?*

A: One of the things I had done was to write a comprehensive outline of what happened in the 1970s in our industry that went right, what went wrong and why, what was probable in 1980, what products would be hot, what products would hit the end of their growth, which companies were likely to be superstars in the '80s and which were likely to be in trouble, what the demographics and family size and economic situation were likely to be, and what this would mean for the home-entertainment industry. And when I got it all together, I decided that probably nobody else in the industry has had the luxury of enough time to put together this astonishing array of information. So I wrote to some people that I know and like in the industry, Peter Sprague among them, and offered to discuss this information. Peter got back to me quickly; we met to talk about the decade of the 1980s — Peter is a bright, fast-moving American — and the conversations got so interesting that I began to feel I didn't want to miss being the one who gets to take a crack at these problems and tries to develop these opportunities. One thing led to another, including a new corporate concept that Advent is working on, to start another corporation to take advantage of opportunities in the 1980s.

Q: *What is your position in Advent's corporate structure? Your title is chief executive officer and vice-chairman of the board of directors, which in this case isn't the same thing as president, since Advent has a president named William Anderson (no relation to* Stereo Review's *editor of the same name). How are the responsibilities divided up?*

A: It's common in companies to have a president who is chief *operating* officer, plus a chairman of the board who is chief *executive* officer. At Advent our chairman is Peter Sprague, and he doesn't want to be the CEO. So in my case, being CEO and vice-chairman means that I'm the boss

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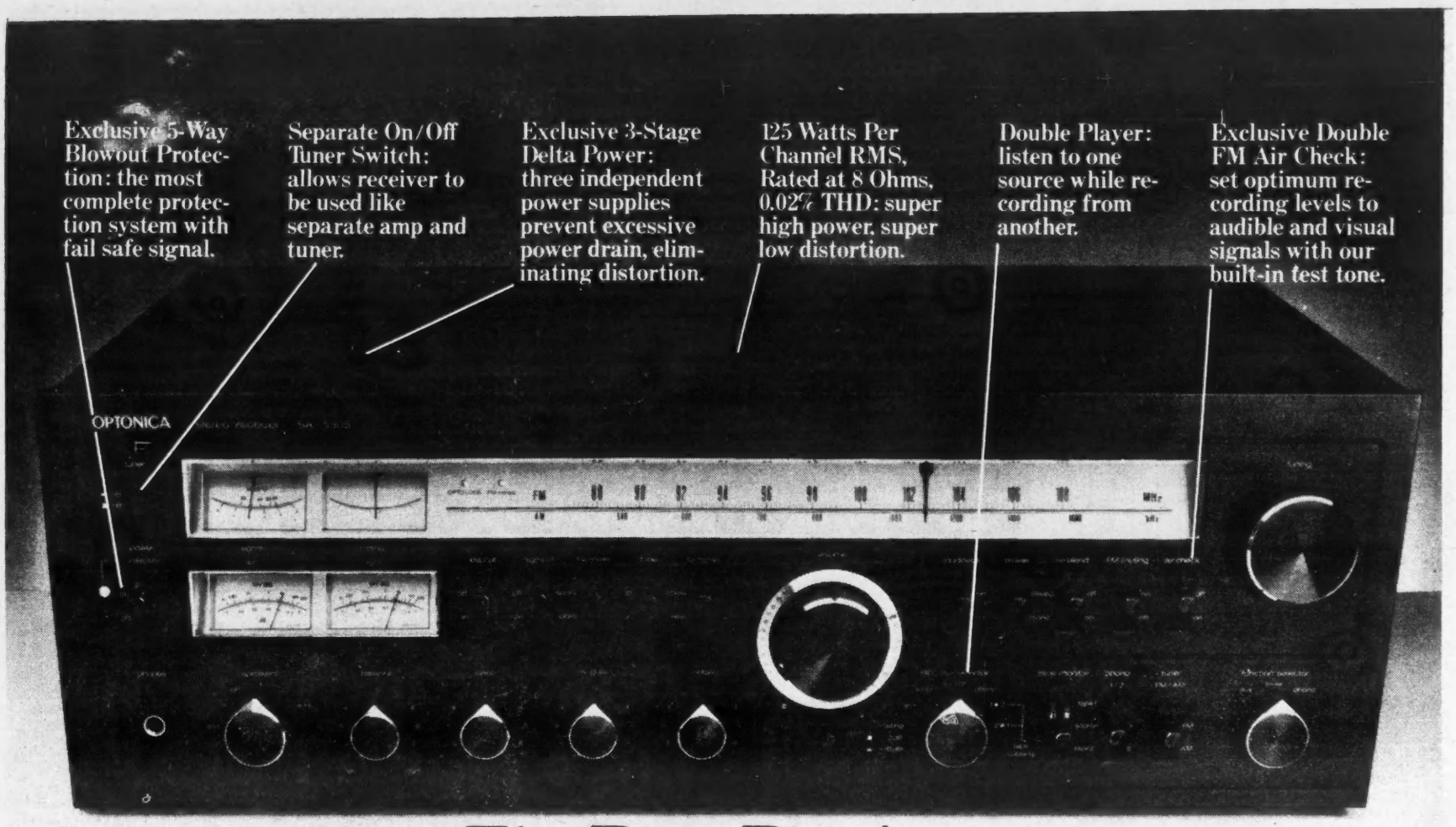
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Mitchell

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of long-term planning with an executive overview of the corporation, and Bill Anderson is the boss of the day-to-day running of the corporation.

Q: *What are your plans for Advent? Do you see it as your mission to revive Advent's leadership in the hi-fi business, or to build on the projection-TV business and expand Advent into a full-line video company?*

A: Advent is a small company that has been successful by working with relatively small, specialty dealers. I think Advent should become larger than it is now, but I don't have any vision of its being a corporate giant, rising up to challenge Pioneer and Sony and Technics. We expect to broaden our line both in audio and in video, growing through selective distribution with high-technology dealers. There are a number of things that Advent can and should build. Advent used to build a cute little radio that was very successful, and there probably will be a market for that again. Advent can build a receiver that is quite different from anything else that's being made — not to compete with receivers built in Japan; those receivers have high quality and reliability and I'm not critical of them — but Advent can build one that's quite different, and will.

Q: *Advent seems to be particularly well-suited for the marriage of audio and video technology that you have envisioned.*

A: Yes, if we can solve some of its problems, Advent can be an anticipatory kind of company, being the first to come out with many of the products people will need as audio and video come closer together in the '80s — even as it was the first company (in the late '60s and '70s) to come out with a big product for the 1980s, the VideoBeam TV.

Q: *Will you try to broaden your video products to cover a full line of video components, including video-cassette recorders, video-disc players, TV-sound tuners, etc?*

A: My judgment right now is that if Advent had a video-cassette machine, it probably would be the smallest in sales (it wouldn't challenge Sony and Panasonic); but it would also be a significantly important product, different from anybody else's, a good product that would be more profitable than most others. So I think that Advent does indeed have a real opportunity in the video-cassette business.

Q: *Are you looking at the LVR (longitudinal video recording) format, as an alternative to the present helical-scan systems?*

A: I know about that technology and its merits, but I also know about the confusion that will be caused in the industry if one or two more technologies emerge in the marketplace. I'm scared of that, as I am of two-speed audio-cassette machines. When you take something that is standard worldwide and universally interchangeable, and start to monkey with the format, whatever you gain is just not enough compared to what you lose.

Q: *But as Philips's patents and control over cassette formats expire, it seems inevitable that we are going to get increasing confusion there.*

A: It does, and it's a shame. As is usually the case, those who have excelled with a product that is as it should be can't stop the losers from trying to change the rules.

Q: *Another big development promised for the '80s is digitally encoded audio recordings, which typically rely on video technology to work. Advent is already in video and has also marketed one digital signal-processing product (the SoundSpace time-delay for ambience); it is logical to wonder whether Advent will be a major force in developing consumer-level digital audio.*

A: I'm still uncertain about the time frame for digital audio. I think it might be a product that will be ready to be born just about the time when it is no longer needed. I think that combination audio/video discs will be so strong in the market that a digital audio-only product may just be an invention whose time has already passed. I haven't reached a conclusion yet, but I think a digital audio-only disc that is competing directly with an audio/video disc will have a hard time.

Q: *So the question is, to what extent do people really want to look at something while they listen to music? Or would they rather their primary music source be audio-only?*

A: Well, when you're at an opera, if you are tired and don't feel like watching it, you can sit there with your eyes closed and listen to it, and enjoy the music. The same is true of a video disc, with its high audio quality and extraordinarily clear video. You can watch it and not listen, or listen and not watch, or you can watch and listen. So if a consumer has the choice of buying a product that gives him all three of those options, it's hard to imagine that he will buy a product that gives him only one option. If the consumer has a product in his home on which he can watch the Met's performance of *Don Carlos*, even if he watches it only once a year, that certainly is a tremendous payload for him.

Q: *US Pioneer's headquarters are in New Jersey, and you have long been associated with activities there and in New York, such as being member of the board of the New Jersey Symphony and the Metropolitan Opera. Are you going to move to Boston now, or commute from New York?*

A: I expect that I'll either buy a house in the Boston area plus a co-op or apartment in New York, or a house in New York plus an apartment in Boston, and spend a great deal of time in both places. That's not just because of the pull of the Metropolitan Opera, although I'll admit that's very strong. It's also because Advent is going to be doing a lot of things in the future, and some of those will probably be based in New York.

Q: High Fidelity Trade News *recently ran a cover story asking, "What's wrong with the hi-fi business?" There appears to be a slump in the hi-fi business, and yet the nation's economists are reporting that the much-predicted recession has failed to materialize because consumers are on a spending spree. Why aren't they buying hi-fi? What is wrong with the hi-fi business, and what can be done to stimulate it?*

A: I think three or four things have gone wrong. First, the public is getting tired of the sales techniques in hi-fi; the industry has developed a less-than-desirable reputation for dealing fairly with our customers. Second, the music business — particularly rock records — has run out of gas. The value of high fidelity in the minds of our potential customers is reduced because music is less exciting than it used to be. Today there isn't really a powerful leadership force in the music business — like the Beatles, or Mick Jagger — to stimulate interest. Also, the demographics are changing: the number of 15-to-25-year-old males is declining sharply, and the population is aging. The hi-fi industry has never been very good at selling its products to females or to older people, and we need to. The hi-fi industry also needs the thrust provided by exciting new products, and most of the new products in the offing are not hi-fi only, they are audio/video products. The hi-fi industry has got to embrace the video industry very quickly. Any dealer who imagines himself as a strong audio-only dealer in 1989 is making a mistake; there won't be many of those.

Q: *It's easy to conclude that your own success has something to do with the fact that high-fidelity audio and video are not just a business to you. You project excitement and confidence about music and about audio/video equipment that seems to arise from deeply felt personal convictions about the values and rewards of this field. Are you really optimistic?*

A: More strongly than ever. The service that we will be able to render to the worldwide public in the 1980s, in products that combine the best of audio and video, is so exciting that this is clearly the 10 years of my life that I'm going to enjoy the most. We're going to be able to deliver live rock concerts with terrific audio and video to places where they never get concerts. We're going to be able to introduce great opera to young kids in Des Moines and to senior citizens in North Dakota — to people who simply don't have access to it and never did. We're going to take people on trips to Bavaria and Istanbul, right in their own living rooms, trips that they may never be able to make. The opportunities to serve people are tremendous, and it's going to be great fun. We'll make people's access to ballet and opera and other classical art forms so easy that those art forms are going to grow as a result. Like the Medici, who helped to bring about the Renaissance, the high-fidelity industry is capable of bringing about a cultural renaissance in the United States in this decade. It's hard not to be proud and excited with that prospect. ●

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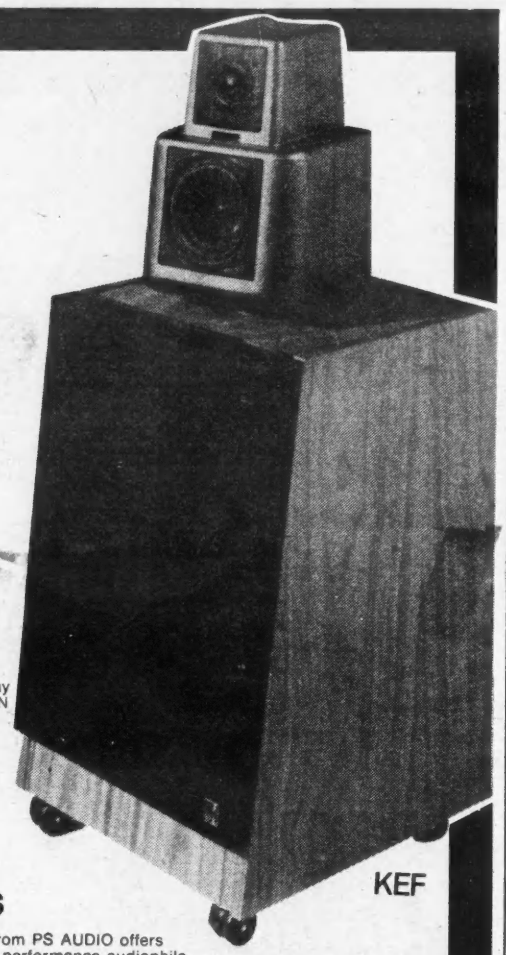

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The Pod.

ACCESSORIES

The Audio Forum stocks a vast selection of audio accessories which can maximize the performance of any hi-fi system at minimal cost. "The Pod" is a new lightweight device which securely clamps the record to the turntable platter and effectively damps out inherent resonances. Special wires from MOGAMI and MONSTER CABLE enhance overall definition and detail while any one of our platter pads can improve bass transient response. We have perhaps New England's largest selection of audiophile records including the new DBX encoded digital recordings. These new discs are nothing short of amazing and are, without a doubt, the most cost effective way of dramatically improving the performance of your hi-fi system.

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CES

Continued from page 4

amplifiers usually require bulky heat-sinking to dissipate their heat, the 100-wat Sanyo P55 contains a liquid cooling system which works like that in an air conditioner or a refrigerator: the heat of the transistors causes liquid Freon to vaporize, the Freon gas travels to an array of thin fins, where it cools and condenses back to liquid, and the liquid Freon returns to the transistors.

Another fast-growing manufacturer is NAD, whose principal new product at the Winter CES was a receiver version of the extraordinary 3020 amplifer. Like the 3020, the 7020 receiver is rated at 20 watts but has 3dB of dynamic headroom, thus putting out 40 watts/channel during musical transients, and also has potent current reserves for low-impedance loudspeakers. The FM tuner section is a no-frills design with excellent sensitivity and selectivity.

Bob Carver's "magnetic" power amplifier has been substantially redesigned and refined since its first introduction, a year ago, and drew a lot of attention for its combination of high power (200 watts) and rather low weight, size, and price. A 500-watt/channel version for "professional" (*i.e.*, disco) use was also on display.

As products are continually refined, new ways must be found to describe their remaining sonic aberrations, and Kenwood came up with this year's best new "problem": "magnetic distortion" due to the proximity of metal (such as chassis parts and front-panel controls) to the currents flowing through the circuit wiring. Solution to this worry: Kenwood's new Audio Purist components use non-magnetic materials (wood, plastic, resins) wherever possible in their construction. Isn't it nice to have something new to obsess about?

In the field of accessories, both Koss and Bose introduced time-delay units for reproducing large-hall ambiance in a home listening room. JVC is finally importing the splendid SEA-80 from Japan; for $500, it is an octave-bandwidth spectrum analyzer and an octave-band graphic equalizer combined in one unit. The spectrum analyzer provides a remarkable education in the relationship of musical tones to audio frequencies and in the relative distribution of energy *vs.* frequency in musical sounds; and if you add an external microphone such as the Superscope EC-1 you can also examine the radiation pattern and frequency response of your loudspeakers as they interact with the acoustics of your room.

For several years, dbx's 120 series of tape-deck noise-reduction systems have been widely used by audiophiles and semi-pro recording engineers to eliminate the tape hiss in high-quality open-reel recorders. Of these units the model 124 was preferred because it contained both encode and decode circuits to permit simultaneous recording and monitoring of the playback signal off the tape, but it cost $400, not an inconsequential investment. Dbx has now reworked the mechanical assembly and the circuit-board layout, substantially reducing its manufacturing cost without sacrificing performance, and the new version — the dbx 224 — will cost only $275, making it a sort of "best buy" for tape-noise reduction. As a bonus, the 224, like the 120 series of units, also can be switched to decode dbx-encoded records, with their splendidly wide range. To put it another way, if you were thinking of spending $110 to get the dbx 21 decoder so that you will be able to enjoy the growing catalogue of dbx-encoded records, for another $165 you can get a powerful noise-reduction system, designed to compete with the dbx units but claimed to be even better because the Sanyo version splits the audio signal into low- and high-frequency sections and operates on them independently, avoiding the "breathing" and decoding errors that otherwise might occur in the 2:1 decibel compression and re-expansion.

Record players

As usual, lots of new phono cartridges and turntables were shown at the Winter CES, but not much is new or unique. The technology of the Shure V15 Type IV has now been transferred to a much less costly series of cartridges, the Shure M97 group. Yamaha was showing a prototype of a new turntable with a straight-line-tracking tonearm and a heavy (25-lb.) cast-aluminum base, to sell for around $1000. And Dennesen had its own straight-line-tracking tonearm riding on air bearings for unmeasurably low friction.

Empire has introduced the technology of its top-of-the-line EDR.9 cartridge into two lower-cost models, the 600LAC and 500ID; improvements include very high tracking ability at mid-range frequencies, a tapered aluminum-alloy cantilever treated with vaporized boron to damp resonances, and "inertial damping," which involves a tiny iron mass suspended within the cantilever so that it tends to vibrate out of phase with respect to the cantilever at high frequencies, canceling the main cantilever resonance and thus smoothing the overall top-end response.

The most remarkable new turntable is the Technics SL-10, introduced on the 10th anniversary of the world's first commercial direct-drive unit, the Technics SP-10. The SL-10 is only as large as an LP record jacket (12½ inches square), and it opens like a clamshell, with the direct-drive platter and associated electronics in the lower half and a complete straight-line-tracking tonearm system mounted in the upper half (what would normally be the dust cover). You open up the system, put a record on the platter, close the cover and hit the "start" button: the tonearm finds the beginning of the record using an optical detector and automatic cueing system, plays the disc, and at the end of the record automatically picks up the arm and returns it to its rest position. The straight-line-tracking arm is balanced and spring-loaded so that it will operate correctly with the player tilted; indeed the SL-10 will even play records while standing. The SL-10 is available with a built-in moving-coil pre-preamp and a factory-installed Technics 310 moving-coil cartridge, and the unit can operate on 12 volts DC (*i.e.*, in a car or van) as well as on 110 volts AC.

Headphones

Two new headphones drew special attention at the CES. The Koss HVX has earpieces of variable acoustic density, transparent at the center and dense around the edges, thus combining the "hear-through" qualities of open-air-type headphones at middle and high frequencies together with the acoustic seal around the edges that circumaural phones employ for flat bass response. Sony's MDR-3 open-air electret headphones are extremely lightweight, only about two ounces, and place so little pressure on the head that it's possible to forget you're wearing them, yet they produce remarkably smooth, wide-range, airy sound.

Loudspeakers

Among the many new loudspeakers, three caught my attention. Electro-Voice has a new subwoofer system, the Interface 16W, in the form of a three-cubic-foot cabinet; the system's response is designed to be flat to 16 Hz. Boston Acoustics showed the new A100, a two-way version of the popular A200, very close in overall sound quality to its bigger brother but at only half the cost: $175. And ADS, which for years has been making splendid little mini-speakers that some people have been using as stereo satellites in conjunction with other companies' subwoofers, introduced a three-piece stereo system of its own with an astonishingly potent subwoofer. The satellites are ADS 400s, similar to the well-known ADS 200 and 300 mini-speakers but a little larger for the sake of greater power handling, and the entire system retails for about $1200. This price includes the two satellites, the subwoofer module, and a built-in amplifier for the woofers. The subwoofer module actually contains a stereo pair of 10-inch woofers, 100-watt power amplifiers like those in the ADS 10 time-delay system, feedback around the woofers to cancel their distortion and linearize their deep-bass response, and electronic low-pass filtering. (The customer's amplifier or receiver, of course, is used to drive the satellites.) In the ADS demonstration room, this system was being used to play Telarc digitally mastered recordings, and at the time I visited the room Telarc's producer, Jack Renner, was listening with an approving ear as the system generated 115-dB peak levels with superbly clean, tight, deep bass.

Tape

More manufacturers of recording tape have jumped on the metal-particle bandwagon. Maxell introduced its metal cassette, announcing that C90s will carry a list price of $15 when they become available. Metal cassettes

Continued on page 46

BASF

BASF

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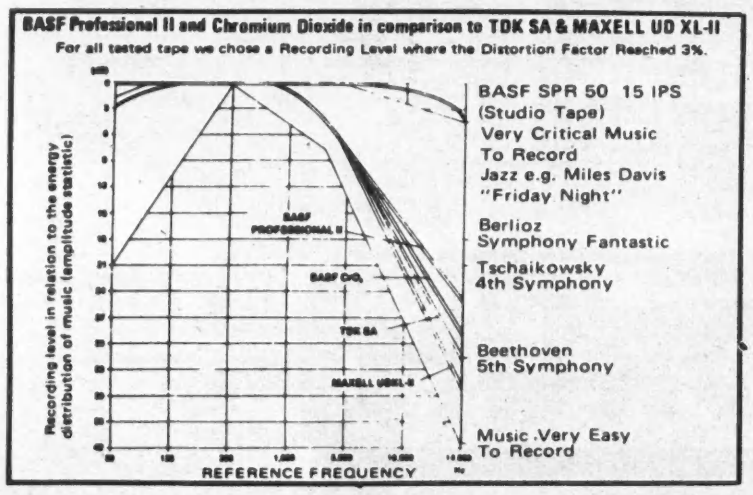
BASF Professional II and Chromium Dioxide in comparison to TDK SA & MAXELL UD XL-II
For all tested tape we chose a Recording Level where the Distortion Factor Reached 3%.
Recording level in relation to the energy distribution of music (amplitude statistic)
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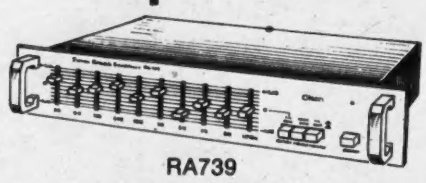

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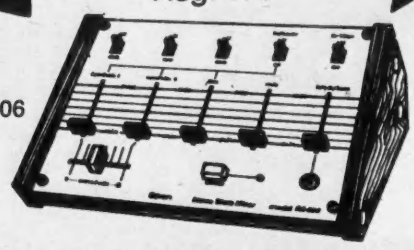

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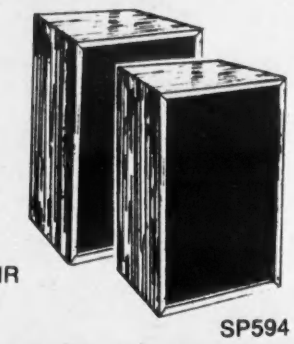

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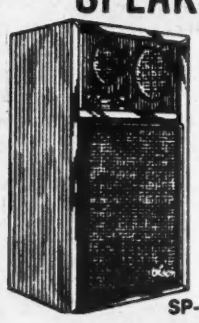

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CES

Continued from page 44

are also coming from Ampex, BASF, Fuji, and Sony, in addition to the brands previously available (Scotch, TDK, Nakamichi). TDK's metal tape, previously available as type MA-R in an actual metal housing, will also be available as type MA in a more nearly conventional plastic housing for $1 less. Fuji became the first supplier to have C90 metal-particle cassettes on the market; most brands are still available only in C46 and C60 lengths. Incidentally, Fuji's C90 is priced at $12, the same as TDK's C60.

The metal bandwagon is slowing down among makers of recorders. Some are continuing to add metal-tape capability to every deck in their lines, including the budget-priced models, but other manufacturers are putting metal-bias positions only on their higher-priced decks on the theory that the high cost of metal cassettes makes them a sensible investment only for audiophiles with high-performance machines and demanding requirements. Meanwhile, most manufacturers are hard at work designing new models with Dolby HX (headroom-extension) circuitry, although apparently only one had an HX-equipped deck ready in time to display at the Winter CES: the Harman-Kardon 705, a low-profile deck in which the cassette is inserted through a slot, as in automobile cassette players. Many manufacturers are expected to have decks with Dolby HX by summer or early fall; the HX circuit essentially accomplishes the same goal that metal tape does, improving high-frequency headroom and thus eliminating the common problem of dull sound caused by tape saturation, but the Dolby-HX approach has the advantage of providing this improvement with ordinary cassettes at conventional prices.

Historically, tape recorders, being the most complex and trouble-prone part of a stereo system, have usually had the shortest warranty periods — from as little as three months to up to one year. Technics' announcement that warranties on its cassette decks have now been doubled to two years is a valuable step in the right direction, and that it can afford to do so reflects the genuine improvement in reliability of most cassette decks in recent years.

Digital

For a couple of years Sony has been making its $4500 PCM-1 digital converter, which connects to a video-cassette recorder to convert it into a stereo audio digital tape recorder, but since it was a one-of-a-kind product, Sony has not been trying very hard to sell it. But now the Electronic Industries Association of Japan has adopted a standardized recording format for such converters, making them a practical consumer product, and they will soon be for sale in models by Hitachi, JVC, Sony (the PCM-10), Toshiba, and Sanyo. Models by Toshiba and Sanyo were on display at the Winter CES, and each apparently is significantly improved in performance over the experimental Sony PCM-1 in the critical area of error correction and concealment, *i.e.*, eliminating clicks and other side effects from the digital-code errors that are caused by the normal minor dropouts which even the best tapes have. The least expensive of these converters appears to be the Sanyo Plus 10, at $4000, and one of its attractive features is an error-correction indicator that monitors the activity of the dropout-compensation circuitry. In addition to showing when dropouts are too severe to be successfully concealed, it also shows the rate at which minor (successfully compensated) dropouts are occurring, allowing the user to evaluate the relative dropout performance of various brands and types of tape. The Sanyo converter is being sold with an included Beta-format tape, in PCM digital form, of Ry Cooder's recent digitally mastered album, but since the majority of owners of video-cassette recorders have VHS- rather than Beta-format machines, the supplied tape is going to be disappointment to the majority of purchasers of the Sanyo digital converter.

Video

The most interesting video display at the Winter CES was in Pioneer's exhibit: the consumer version of the Pioneer optical video-disc player, which will be marketed next fall or winter for "under $1000." Pioneer has been making an "industrial" version for use by General Motors dealers, with lots of convenience features, but it had been expected that the consumer version would be substantially simplified and less versatile. Instead, Pioneer has chosen to provide a full and impressive array of operating features in the consumer version: slow motion, forward and reverse play, stop motion, and the ability to address by number any of the 54,000 frames on a disc, hold this single frame on the screen, and "sequence" forward or backward one frame at a time, so that video discs can be used as a text-storage and retrieval system with tremendous information capacity as well as a 30 frames/second video system. And all of these functions can also be operated by wireless remote control. It's not hard to predict that this is going to be the biggest-selling Christmas gift for affluent Americans next winter.

In video-cassette recorders the principal news is that VHS machines are offering more flexibility of operation; for instance, the new Magnavox 8229 and RCA 625 VHS six-hour decks offer single-frame, slow-motion and double-speed play, and a real convenience — wireless remote control — that operates all of these controls plus channel selection, record, and pause.

Like all tape recorders, video-cassette machines require periodic cleaning of the heads, but the job requires disassembly of the machine and rather costly special foam-tipped cleaning sticks. So Scotch and Fuji have now introduced head-cleaning cassettes: you simply pop the cassette in the machine and play it for a few seconds to clean the heads. Every video-cassette deck owner should get one.

BASF and Toshiba are both getting ready to put their LVR fixed-head video recorders on the market. BASF has opened a factory in Fountain Valley, California, that will manufacture the BASF machine for worldwide distribution. Toshiba exhibited a substantially refined and improved version of its LVR recorder at the show; it now has a two-hour playing time, obtained by recording 300 parallel 25-second tracks on the tape. Because of its simplified internal construction, compared to VHS- and Beta-format video recorders, Toshiba expects to offer the basic LVR recorder at $500, and a fancier model with programmable tuning for around $700, starting next winter.

Maxell and TDK have developed HG (high-grade) versions of their video-cassette tapes with finer particles offering improved picture quality at the slow six-hour speed and reduced chroma noise at all speeds. They will cost only a dollar or two more than present formulations.

Other goodies

The influx of personal computers, microcassette recorders, smaller and more sophisticated calculators, electronic games, digital watches, pocket-sized radios, and TV sets with screens ranging from two inches to seven feet continues unabated. A couple of new product categories deserve special note. One is the "information processor," a device a little larger than a calculator with plug-in memory modules that can store and display nearly any type of desired data. The first machines of this type were language translators from Lexicon and Craig; you punch in an English word and the unit would display the French (or German or Italian, according to the plug-in module purchased with the unit) equivalent. With prices generally in $150-$200 range and brand names such as Nixdorf, Quasar, Toshiba, and Panasonic, these hand-held units can also be used for metric conversion, recipes, word games, storing names and phone numbers, etc.

Another product category is the game computer, a computer programed exclusively to play specific games with a high (or switch-selectable) level of skill. In the past, such electronic-game players have required either connection to a TV set to display game activity or the use of a formal computer terminal at which the user would sit, entering his moves on a keyboard. Now Chafitz Inc. has introduced a series of "artificial-intelligence" games in the normal physical format of the games themselves — for instance, computer chess played with conventional-looking chessmen on a normal-looking chess board that automatically detects the moves you make, analyzes them, and plans the best responding moves.

We haven't mentioned one other huge group of products shown at the Winter CES: stereo components for the car. Their variety is great, and they will be the subject of a separate report, later in the spring. ●

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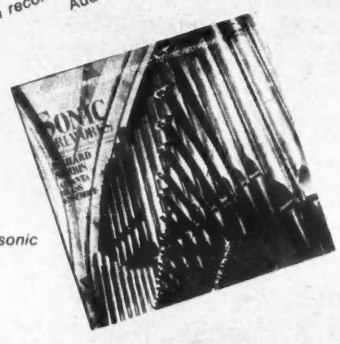

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The receiver in MSL's $650 system is a slimline Onkyo TX-20, with Servo-Lock tuning and 30 watts per channel (8 ohms, 20-20kHz.) at only 0.08% distortion. It drives a pair of remarkable new KLH 4 loudspeakers with polypropylene woofers and dome tweeters. The turntable is a belt-driven, servo-controlled Sanyo TP-1010 with automatic shutoff and a light-tracking Audio Technica AT100E cartridge.

Compare MSL's $650 Onkyo/KLH/Sanyo system with similarly-priced combinations offered elsewhere. The sound demonstrates dramatically that MSL stands for high performance stereo without the high price.

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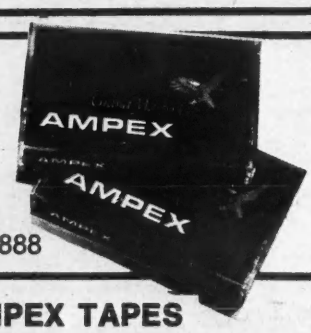

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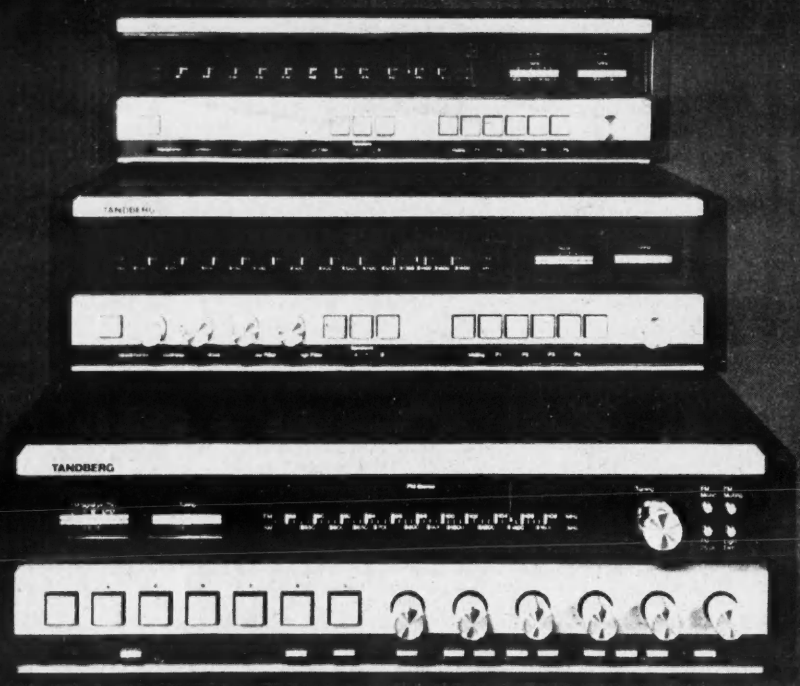

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